the OIL AND GAS JOURNAL

OCTOBER 29, 1956

New light on

FRACTURING

Through Perforations

Here's why only a small part of the formation is fractured. p. 95

- **Future Autos: Turbine or Free Piston?** p. 62
- **First Fuel-Injection System Offered Public** p. 66
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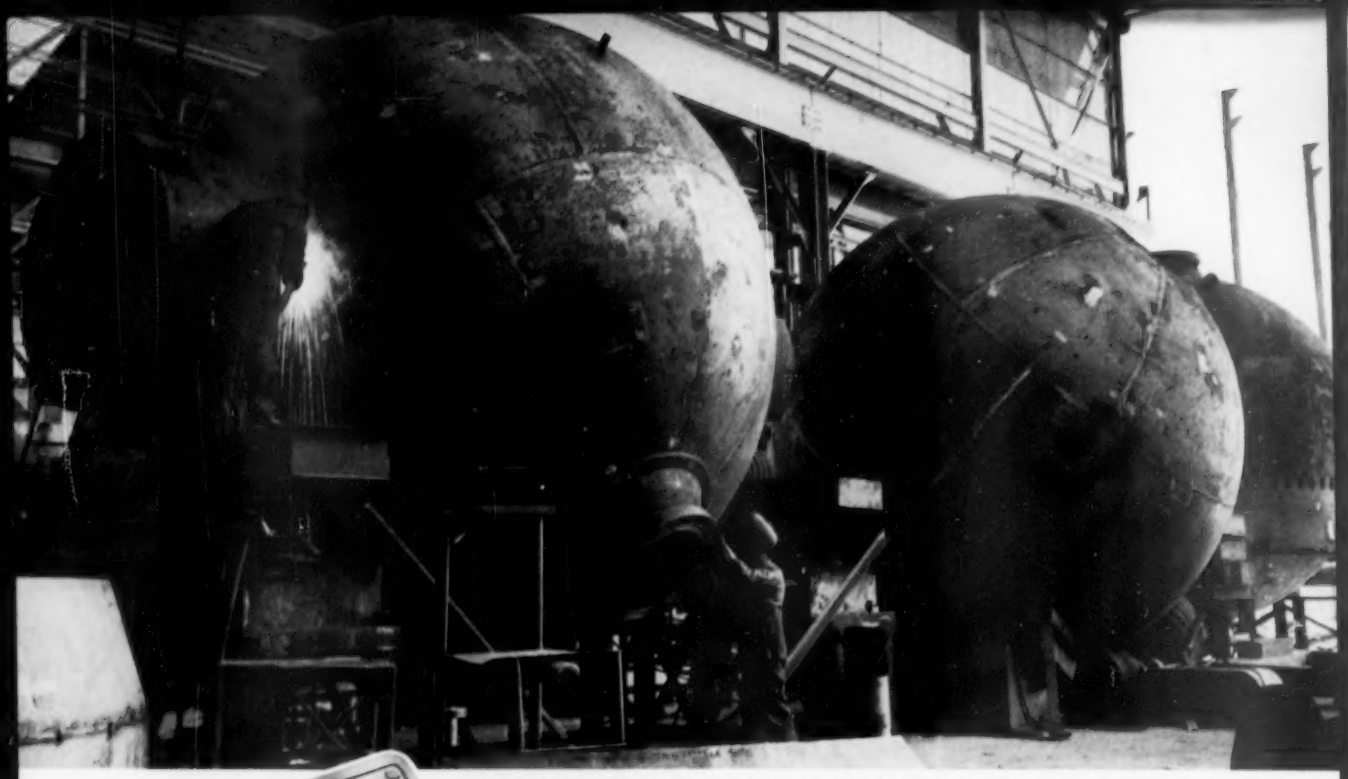

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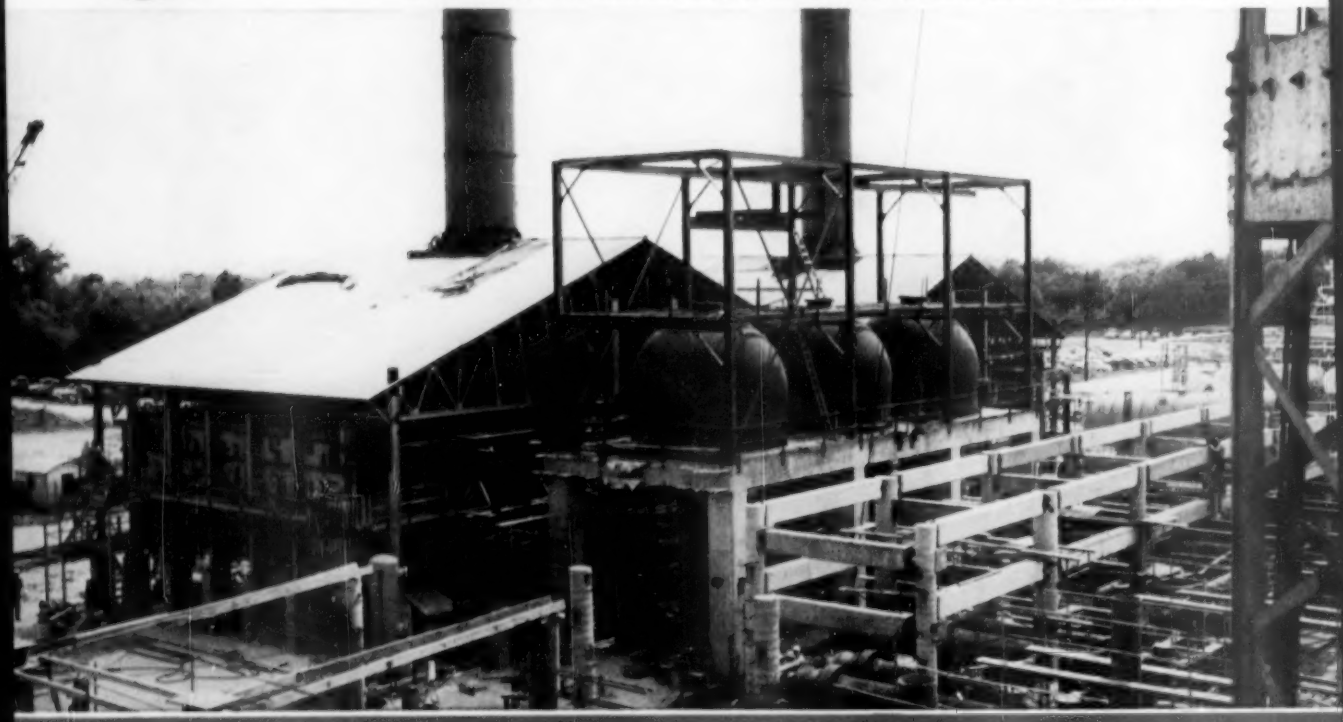
SPHERICAL REACTORS for the SOVAFORMER PROCESS

AS INSTALLED BY BECHTEL CORPORATION FOR MAGNOLIA PETROLEUM COMPANY



MANUFACTURERS AND ERECTORS SINCE 1913

A Glance Ahead . . . . at press time

These trends will make TOMORROW'S NEWS

Final decision on whether to set up new goals for oil-country tubular goods and steel plate, possibly also on alkylate, is not expected before March.

Mobilization Director Arthur S. Flemming has put off his decision until military requirements for fiscal 1958 are in. That will defer it until after the turn of the year and Congress may have something to say about tax amortization when the matter of new programs is raised.

California's delayed water floods may get under way soon after the November 6 elections. Several operators have held up plans hoping that Proposition 4 will be approved. If it is, its unitization provisions can be used to expand these floods into pool-wide projects.

Rehearing of the fair field price question may be granted to Panhandle Eastern Pipe Line Co. by the Supreme Court—but it is unlikely. The court seldom goes over the same ground twice. Many were surprised when it reheard the Phillips case. It has refused Panhandle's plea for a stay of its order affirming a lower court decision that price must be related to cost.

The oil industry is keeping its fingers crossed pending outcome of the general election in Louisiana.

A constitutional-convention provision is on the ballot. The general fear is that if it should pass, the ultimate result would be greatly increased oil and gas taxes. Governor Long tried to push tax increases through the legislature only a few months ago. They failed, but only because passage required a two-thirds majority. A rewritten constitution, oil men fear, could make it much simpler to soak the industry.

A prime quality coke for metallurgical uses will be made in Continental Oil Co.'s new delayed coker now building at Lake Charles by wholly owned Lake Charles Chemical Co. The unit will operate alternately on virgin paraffinic feed and catalytic stock. The latter, of high aromatic content, will make excellent coke to be calcined locally in a unit jointly owned by Conoco and National Carbon.

Lube oil manufacturers may take heart from some recent thinking on jet aircraft lubricants. In order to get the needed high temperature stability for use in future aircraft, the military will probably relax the current low-temperature requirements.

With this restriction raised, mineral oils which degrade less than current synthetic oils at 700° F. may be back in the picture. Furthermore, the lubricant requirements for gas-turbine automobiles are now expected to be no more severe than for the pre-Korean jet aircraft which operated satisfactorily on petroleum-based oils.

Widespread oil exploration off Mexico may start in the near future. Much of the Continental Shelf off Mexico's gulf shore is considered good prospecting grounds.

Off the coast of Yucatan, for instance, subsurface geology indicates an extension of promising inland strata, and seismic surveys have found possible salt domes similar to highly productive structures off the Louisiana coast. What's more, there is a wide belt of relatively shallow water off the Yucatan coast.

The OIL AND GAS JOURNAL

OCTOBER 29, 1956 • VOLUME 54 • NUMBER 78

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TECHNOLOGY—OPERATION

Refining-Processing

How Equipment Stands Up in Catalytic Reforming 103

By J. J. Hur, J. K. Deichler, and G. R. Worrell

An outline for the selection of materials to be used in catalytic reforming, based on (1) precluding hydrogen attack, and (2) providing resistance to sulfidation for hydrogen-sulfide corrosion.

On The Job . . . In The Plants 115

Automatic meters blend lube oil faster—simple coding method improves safety—lease house provides meter-run shelter—improvised still runs waste lean oil.

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Diesel-Electric Traction Power in Drilling 84

By B. H. Hefner

Locomotive power units produce the same type of pull needed by draw works. Series-wound motors best fit this application as well as the drive for rotary table and mud pumps. Control of generator excitation provides power control of motors.

New Approach to Electrification of Rigs 88

By F. A. Compton and C. F. Neithamer

Modified, transportation type of electric motors, generators, and control on drilling rigs can increase efficiency. This standardized, mass-produced equipment keeps initial costs low.

Railway Equipment Performs for Phillips 92

By H. D. Redding

Here is how diesel-electric power was put to use in a rig layout designed for an offshore platform. Derrick and draw works are skidded from well to well—a cheaper system than a multiple-well derrick using a movable crown block and rotary.

Fracturing Through Perforations 95

By Marion H. Stekoll

In hydraulic fracturing, perforations act as a number of pressure-relief valves, each set to open at a different pressure. A few of the perforations that will fracture at lowest pressures may take all the fluid injected. Rate of injection is thus an important variable.

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By Dr. John M. Campbell

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By J. E. Lyle

To construct pipelines in cold weather, a contractor must be resolute and resourceful to overcome such difficulties as repeated snow removals, trenching in frozen ground, and adjustment of work methods to suit varying conditions.

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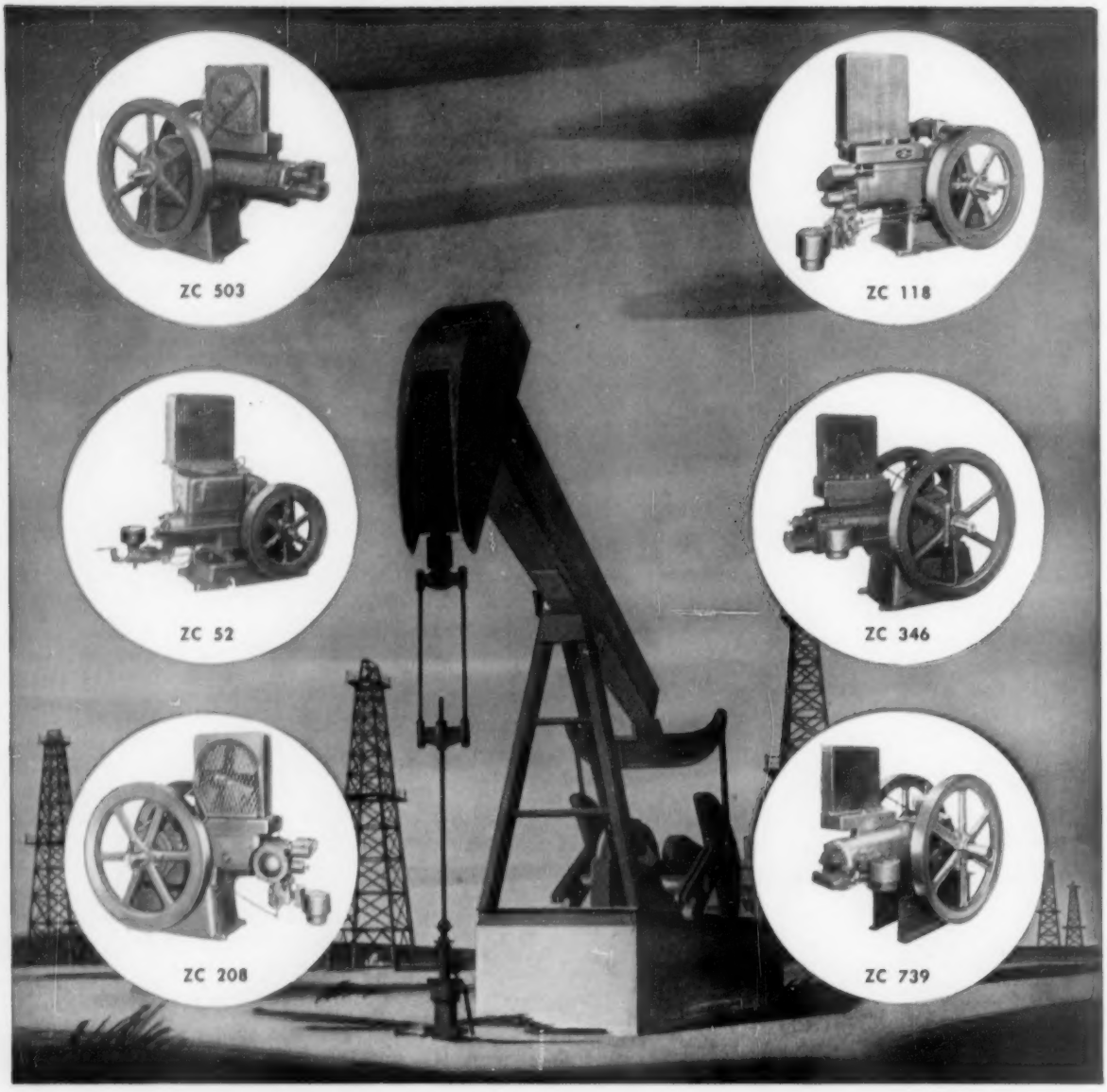

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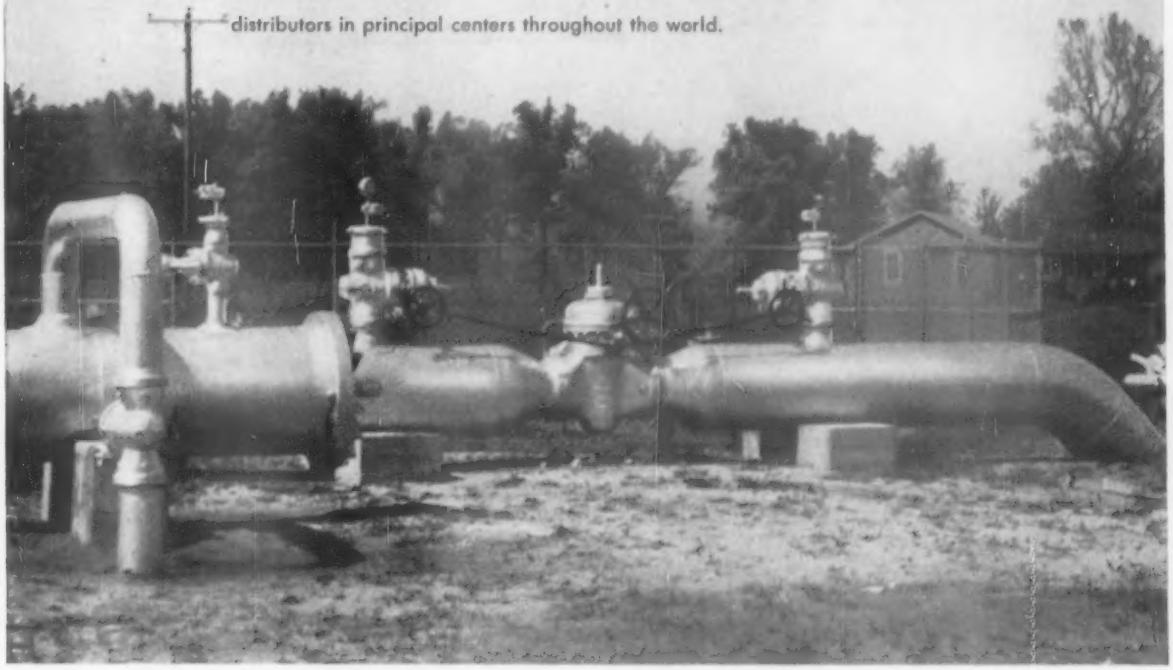

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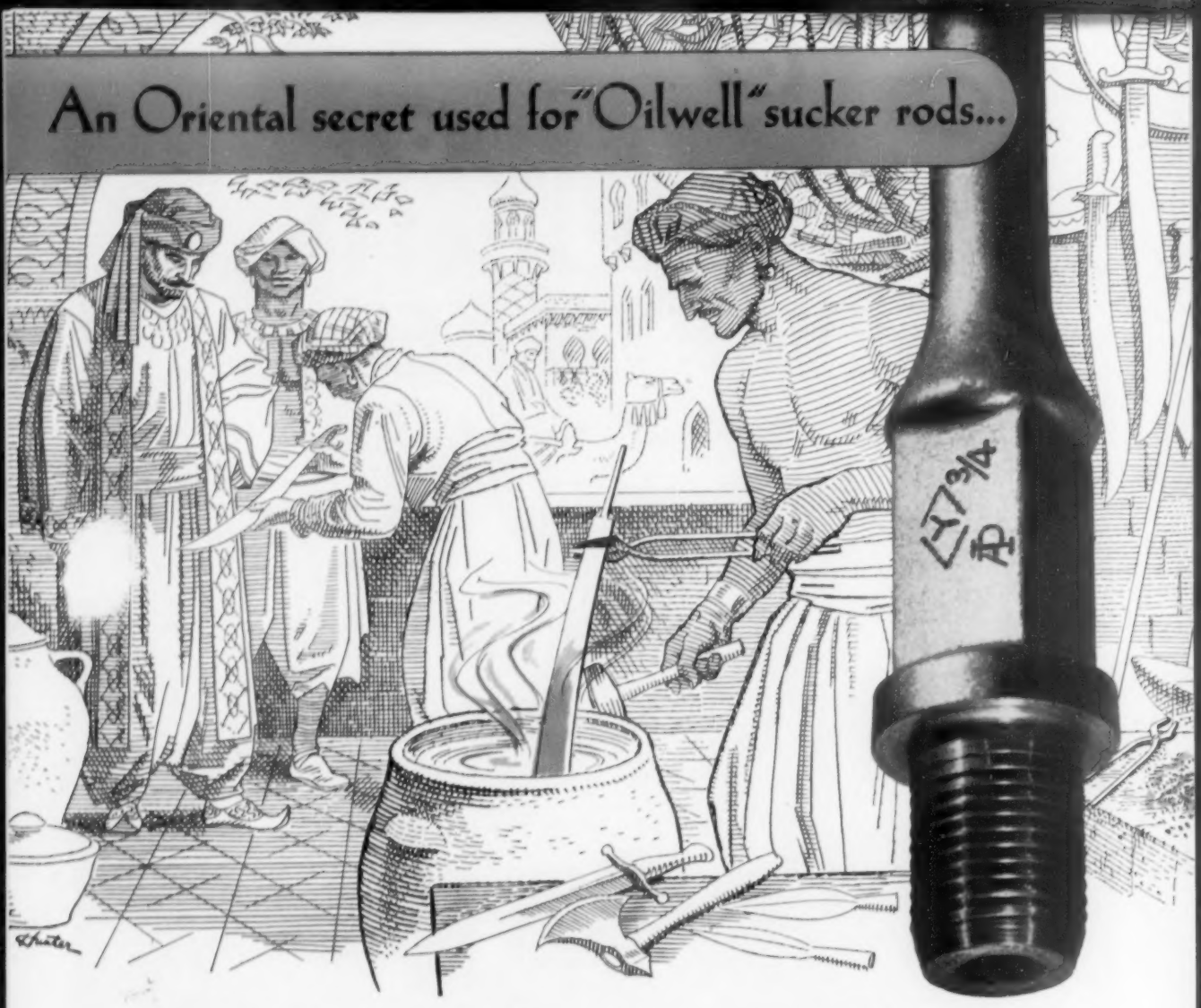

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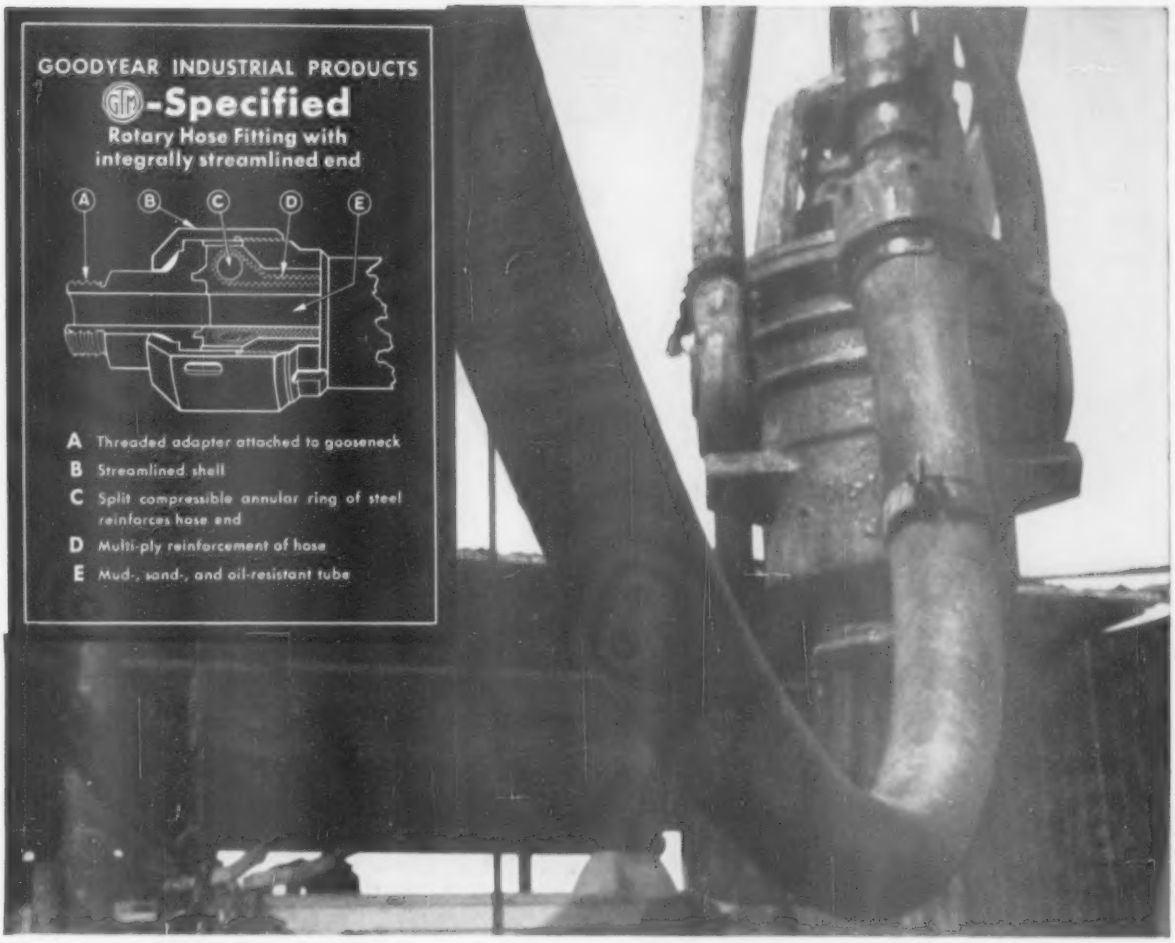

G.T.M.-Specified Rotary Hose "like new" after 16 wells

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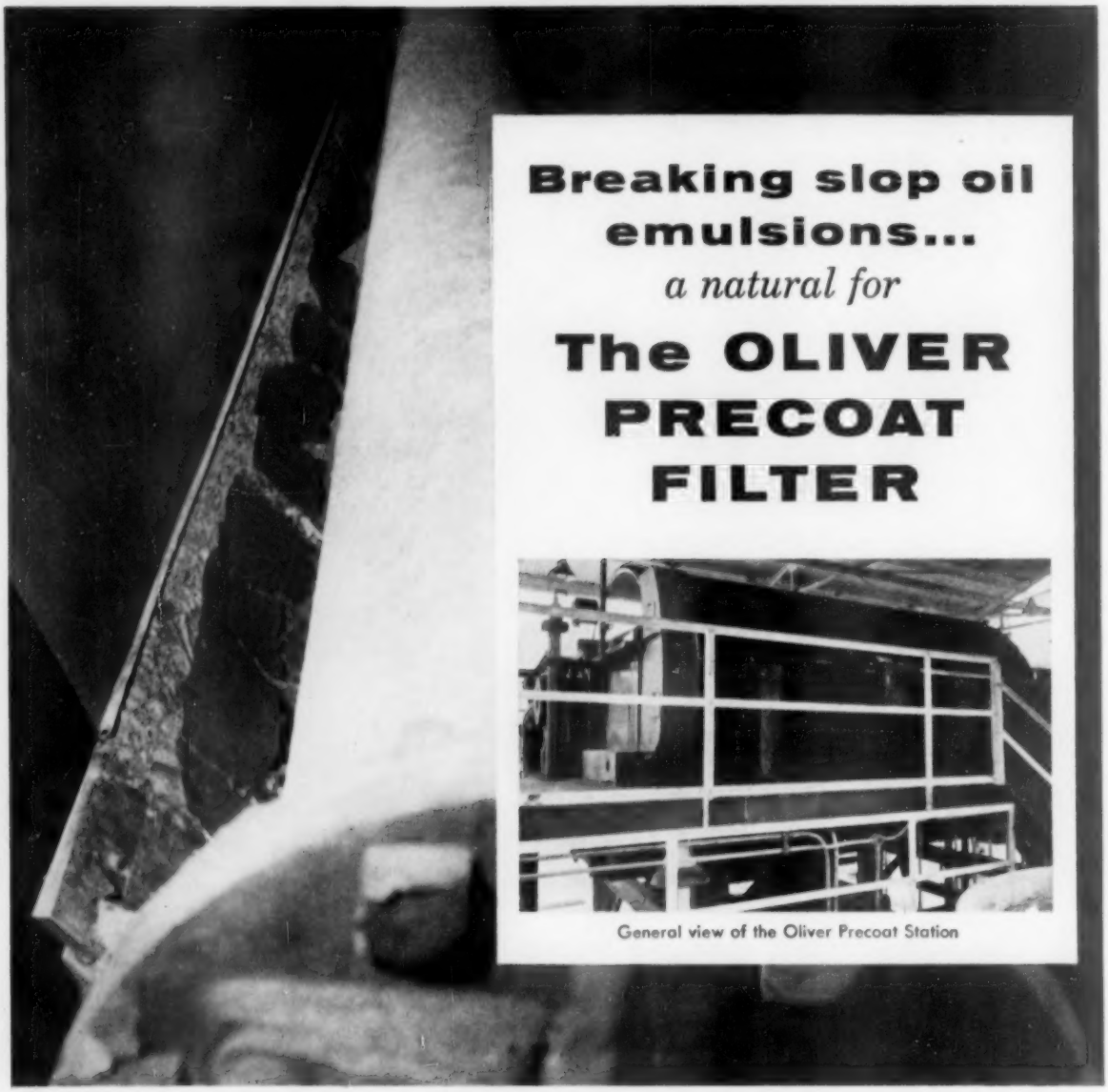

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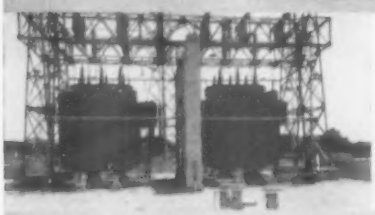
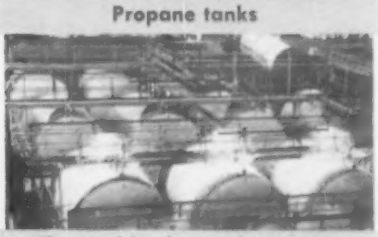
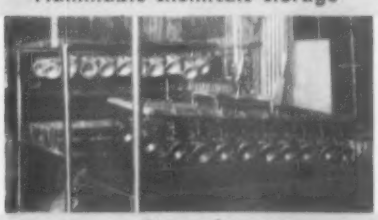
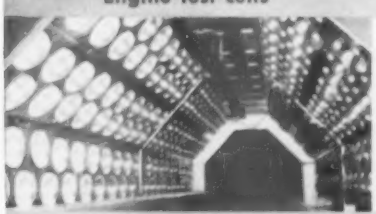
 Transformers	Propane tanks	**WATER SPRAY** Grinnell ProtectoSpray; Grinnell Mulsifyre Systems
Bulk oil storage tanks	 Flammable chemicals storage	**FOAM** Grinnell ProtectoFoam System
Engine test cells	 Dip tanks	**CARBON DIOXIDE** Grinnell CO_2 System
 Infrared driers	Flammable liquid pumping stations	**DRY CHEMICALS** Grinnell Dry Chemical System

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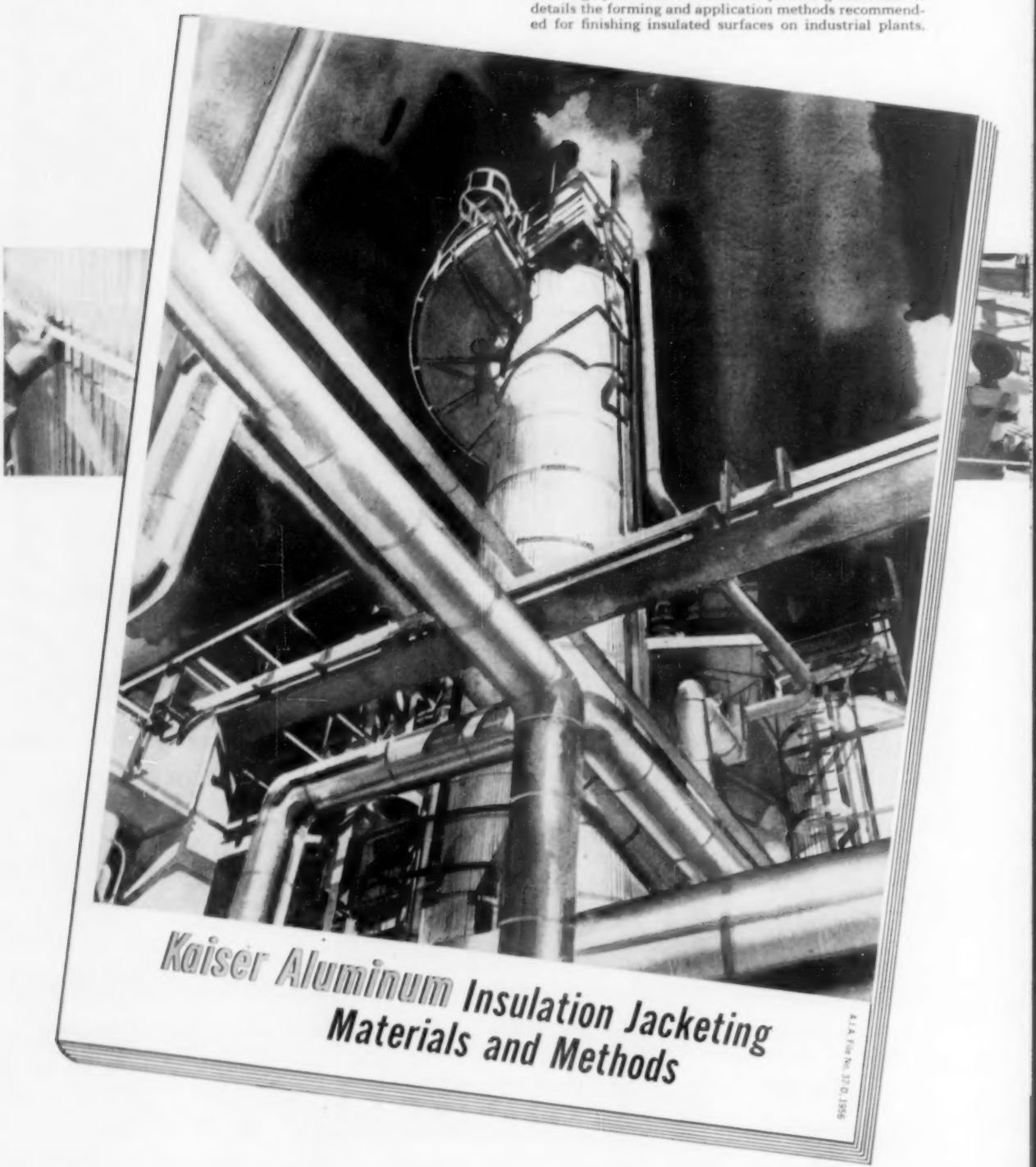

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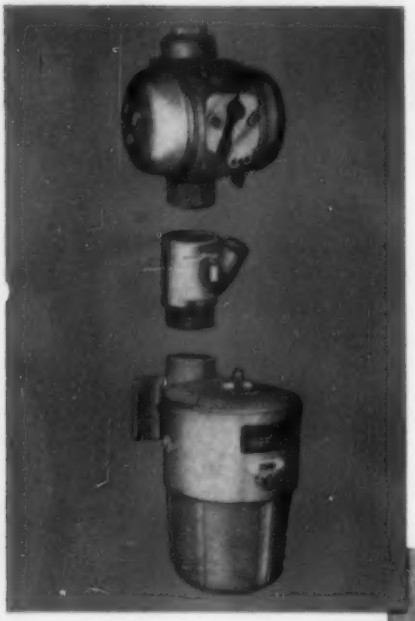

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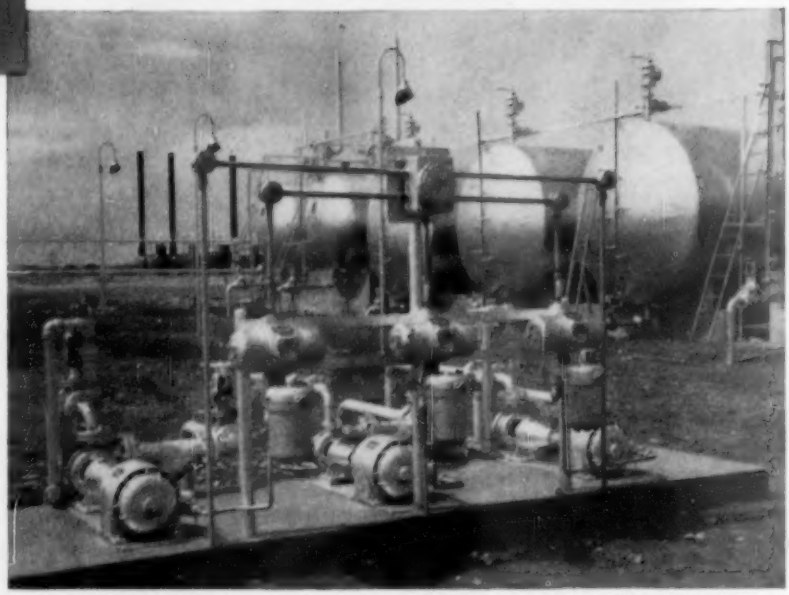

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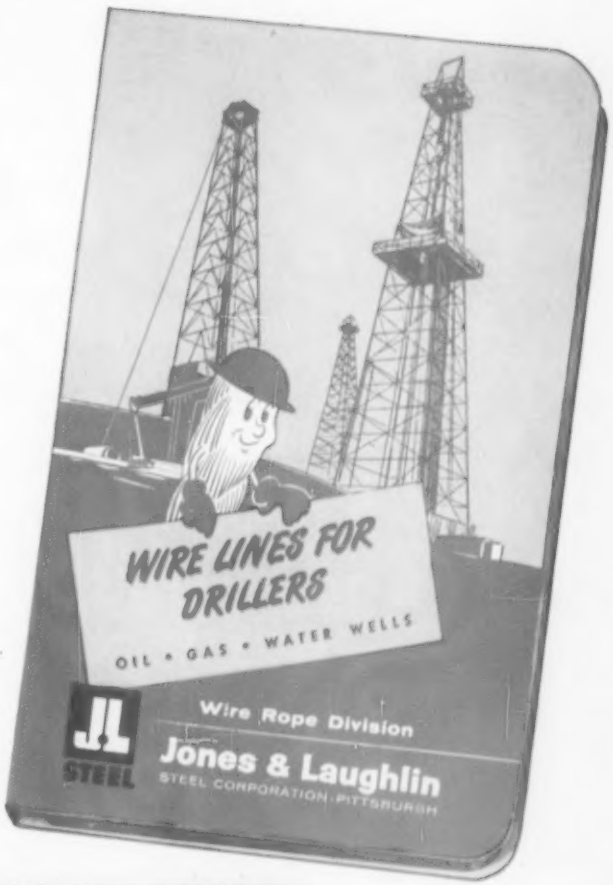
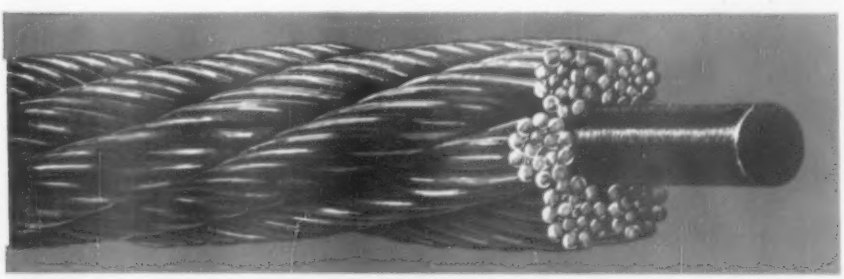
THE PLASTIC CORE . . . has more uniform diameter. Retains resiliency, gives cushion-like, firm, uniform support for outer steel strands throughout the complete length of the rope.

THE PLASTIC CORE . . . has joints which are fused under heat, resulting in a connection that gives a permanent, continuous, uniform center in which no splice failure is possible.



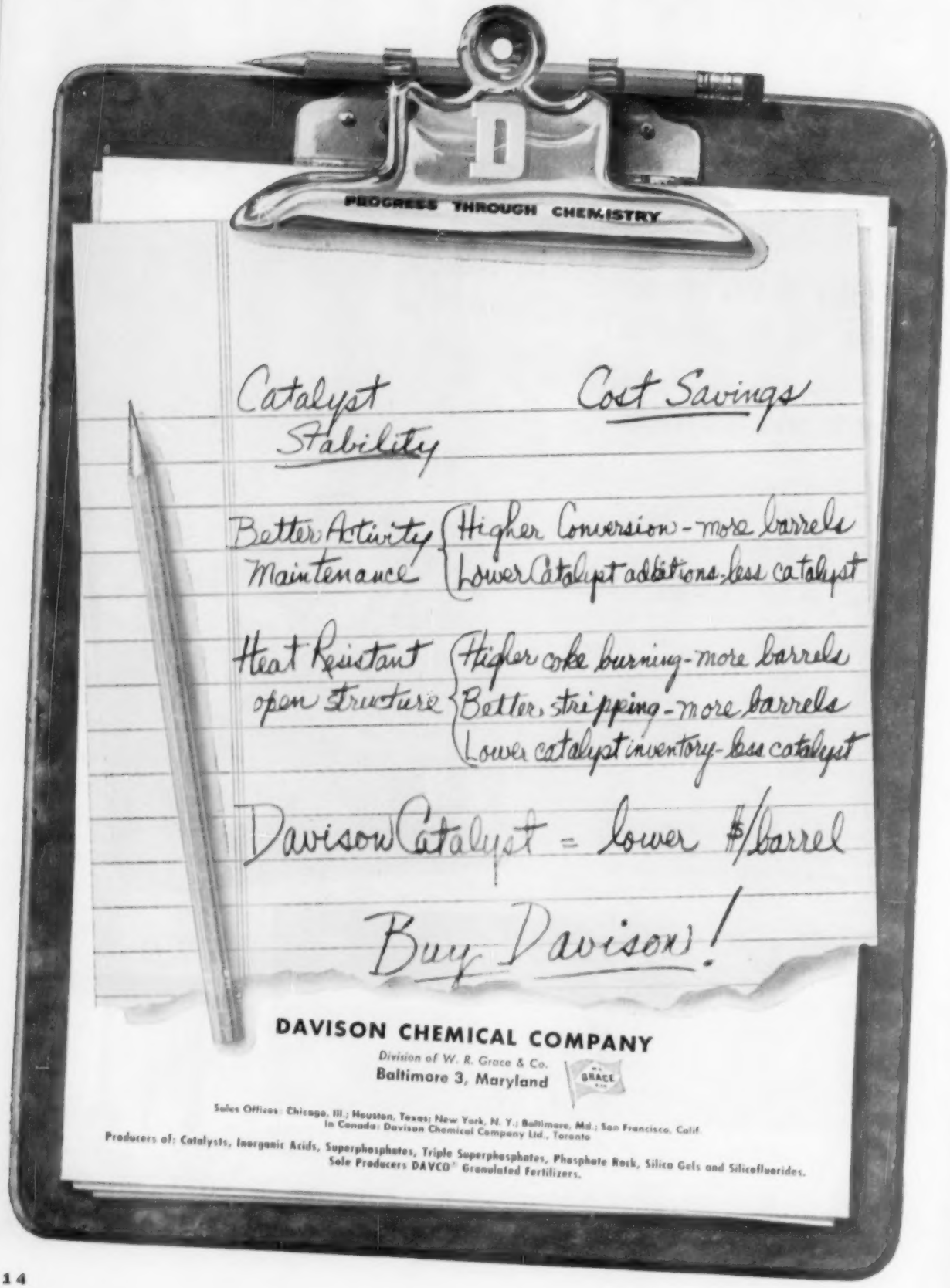


Take advantage of these features for longer service life from your drilling and sand lines. Ask your J&L Wire Rope distributor about PLASTIKORE, or write us direct for the source nearest you.

Jones & Laughlin Steel Corporation

Wire Rope Division, Muncy, Pennsylvania

J&L STEEL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PROGRESS THROUGH CHEMISTRY
Catalyst Stability
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Lower Catalyst additions - less catalyst
Heat Resistant open Structure
Higher coke burning - more barrels
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Sales Offices: Chicago, Ill.; Houston, Texas; New York, N. Y.; Baltimore, Md.; San Francisco, Calif.
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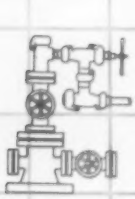
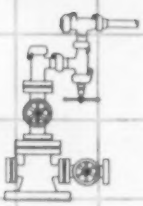
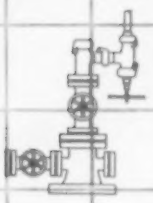
Producers of: Catalysts, Inorganic Acids, Superphosphates, Triple Superphosphates, Phosphate Rock, Silica Gels and Silicofluorides.
Sole Producers DAVCO® Granulated Fertilizers.







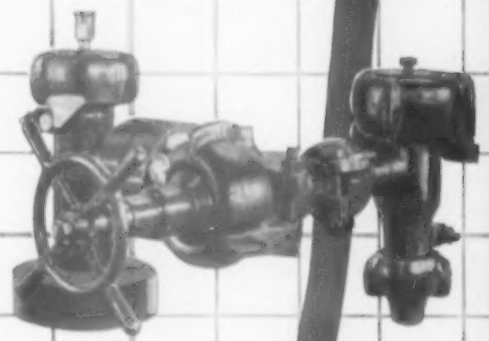
UNIBOLT
flow manifolds

fit your pressures as well as your pocketbook

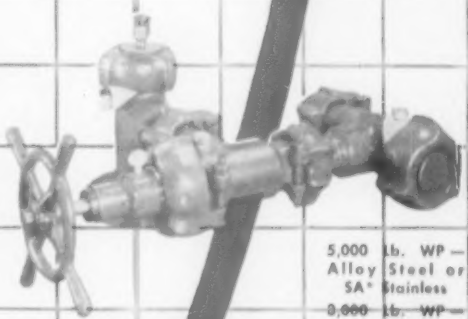
These are the Christmas tree manifolds that are custom-built to any operator's flow control needs, but at no premium in price. Unlike manifolds of fixed design, UNIBOLT permits complete flexibility in arrangement of its units. Components may have threaded, flanged or UNIBOLT connections. They may be of malleable, regular steel, alloy or SA* stainless, depending upon pressures and service. The chokes may be adjustable or positive with interchangeable flow-rated beans or X-beans. Tee type for single wing or cross type for double wing trees are available. Select exactly what you need for the well. Later on you may salvage the entire manifold as a unit or as individual parts for use elsewhere. By any yardstick, UNIBOLT Flow Manifolds give you far more desirable features . . . at a reasonable cost.

*Special Analysis

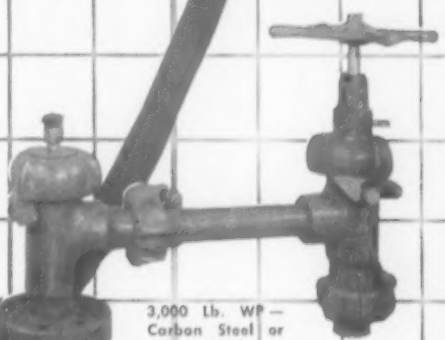
THORNHILL CRAVER CO.
P. O. BOX 1184 HOUSTON, TEXAS



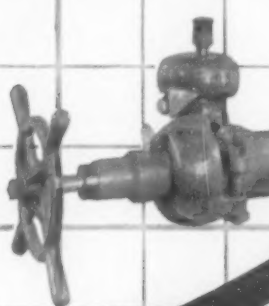
10,000 Lb. WP — Alloy Steel or SA* Stainless



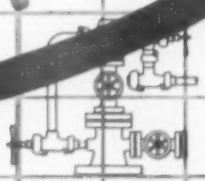
5,000 Lb. WP — Alloy Steel or SA* Stainless
3,000 Lb. WP — Carbon Steel or SA* Stainless

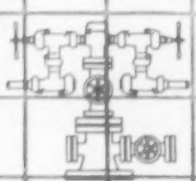


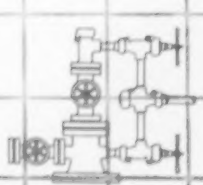
3,000 Lb. WP — Carbon Steel or SA* Stainless
5,000 Lb. WP — Alloy Steel or SA* Stainless



3,000 Lb. WP — Carbon Steel or SA* Stainless
5,000 Lb. WP — Alloy Steel or SA* Stainless



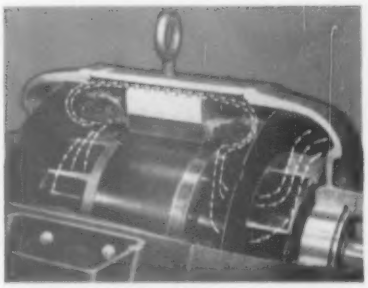




NEW ROBBINS "SERIES 254U" RE-RATED FIVE BIG

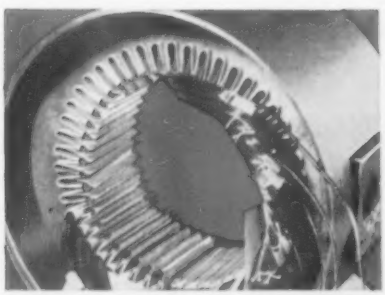
FULL HEIGHT END HEAD PROTECTION
One piece shrouded end heads give full height protection against moisture and falling objects. Internal baffles complete splash-proof construction.

& MYERS MOTORS offer you... ADVANTAGES!



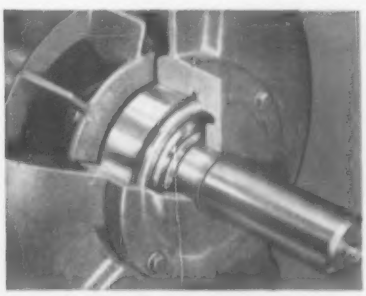
"STRAIGHT THROUGH" DUAL-SWEEP VENTILATION ELIMINATES "HOT SPOTS"

Tandem fans, one pushing and the other pulling, produce washing action around and over field coil ends, insure lower internal temperatures and longer dependable operation.



MYLAR* INSULATION INCREASES MOTOR LIFE. Mylar*, laminated to rag paper insures positive insulation and assures virtually permanent protection because of its excellent dielectric qualities. In addition, the rag paper backing provides a cushioning effect for added resistance to abrasions and punctures.

*DuPont registered trademark.



BEARINGS EASILY INSPECTED

Removable cover plate at each end of head permits easy bearing inspection without dismantling motor. Bearings run in double-width races, thus have extra-large reservoirs containing grease selected to resist dust, temperature, humidity and high operating speeds.

PERMANENTLY NUMBERED LEADS SIMPLIFY INSTALLATION AND MAINTENANCE

Proper lead identification is assured even after years of exposure. Numbers are permanently impregnated into the sub-surface of the insulation . . . can't wear off or deteriorate.

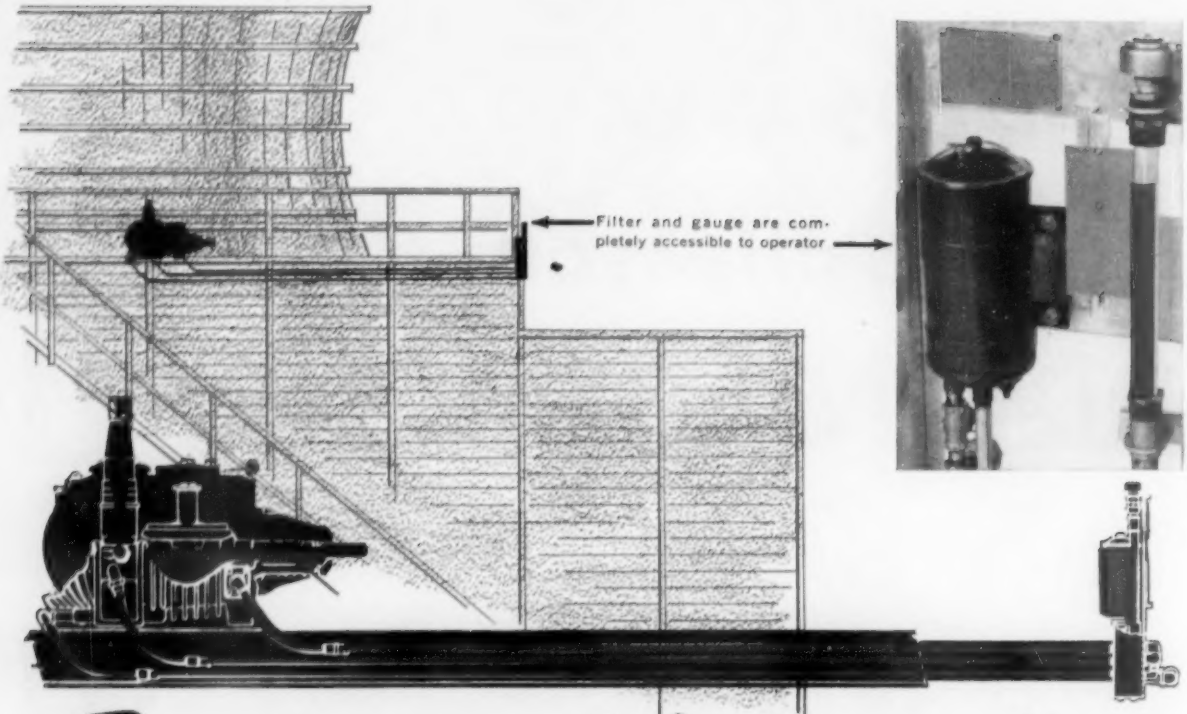
THESE five big advantages make R&M's "Series 254U" re-rated motors your best buy for applications requiring dependable, full-time performance. They can be installed in any environment, outdoors without a cover or in damp and corrosive atmospheres. Moisture, rust or corrosion can't affect their operation, and they take rugged duty in stride! Every R&M motor is electrically and mechanically designed to withstand the most severe operating conditions. Careful quality control and precision manufacture insure top performance and dependability year after year. Write today, for R&M Bulletin 520-OG on R&M's "Series 254U" re-rated motors!

R&M

ROBBINS & MYERS, INC.

SPRINGFIELD, OHIO / BRANTFORD, ONTARIO

Motors Fans Hoists Moyno® Pumps Propellair® Industrial Fans



Engineered Lubrication

PAT. PENDING

for

COOLING TOWER POWER

Another important Marley first

"Clean Oil and Plenty of It!" That has always been the simple formula for long service life and low cost maintenance of cooling tower speed reducers. Now this standard can be attained and MAINTAINED by operators of towers equipped with Marley Packaged Tower Power, the only tower mechanical equipment that has ENGINEERED LUBRICATION.

Marley Engineered Lubrication provides a complete change of clean oil up to ten times during every hour of operation. By constantly circulating the oil through a renewable cartridge filter all particles of foreign matter, sludge and emulsion are removed, not once every six months but minute by minute. With Marley Engineered Lubrication, clean oil stays clean; it is not subject to progressive contamination from the moment it is put in service.

Engineered Lubrication gives the operator safe, logical, full-time control. With both filter and sight-gauge mounted outside the fan cylinder and always in view he takes nothing for granted. He knows the oil level in every Geareducer at all times. He can obtain oil samples for testing without shutting down the fan.

Engineered Lubrication is an epochal advancement in cooling tower service and operating economy. The Marley engineer in your nearest major city awaits an opportunity to show you how it functions without wear on any parts of the centrifugal-type flow system, without added power, without effort. Call him or write

MARLEY

Founder Member Cooling Tower Institute

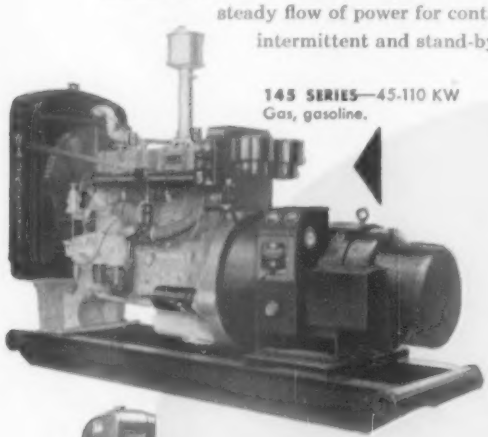
The Marley Company

Kansas City, Missouri

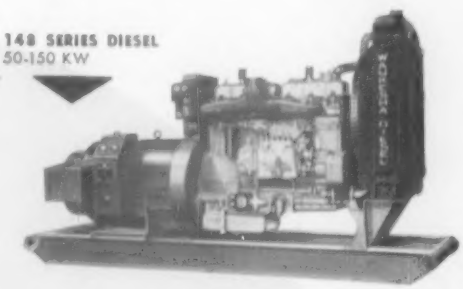
NOW— a complete line of
WAUKESHA
Industrial ENGINATORS®

Waukesha now offers you a superb line of Enginators—backed by half a century of experience in building heavy-duty internal combustion engines and electrical equipment. Designed for reliable performance on all types of fuel, these Waukesha power units supply accurately balanced engine and generator combinations in applications requiring a smooth, steady flow of power for continuous, intermittent and stand-by duty.

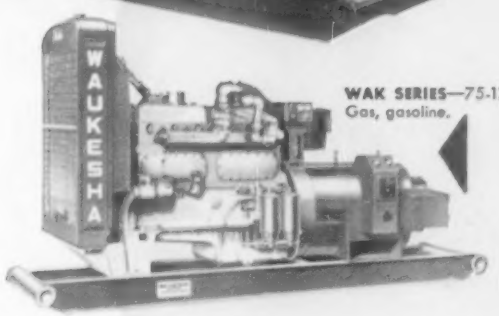
50-600 KW • NATURAL GAS LPG • GASOLINE • DIESEL



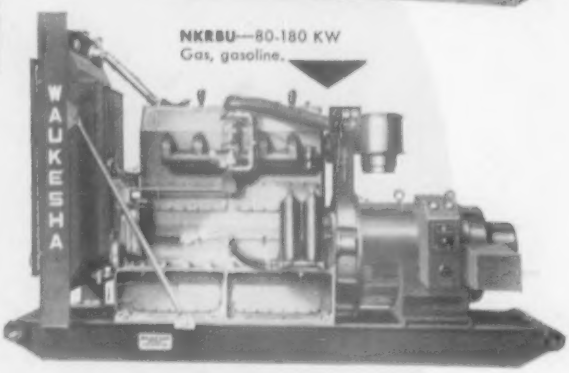
145 SERIES—45-110 KW
Gas, gasoline.



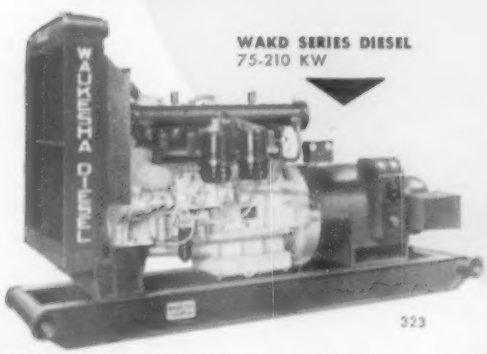
148 SERIES DIESEL
50-150 KW



WAK SERIES—75-170 KW
Gas, gasoline.

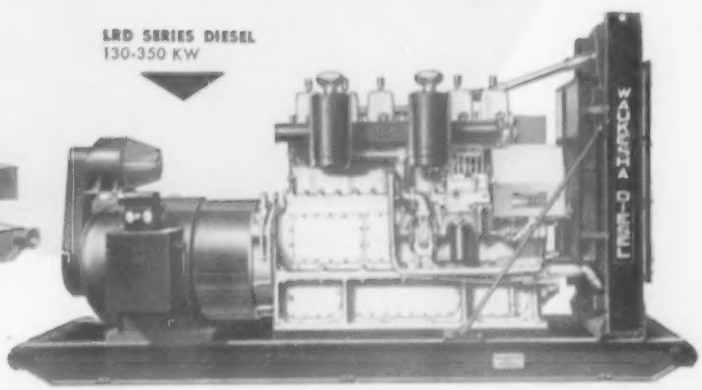


NKRBU—80-180 KW
Gas, gasoline.



WAKD SERIES DIESEL
75-210 KW

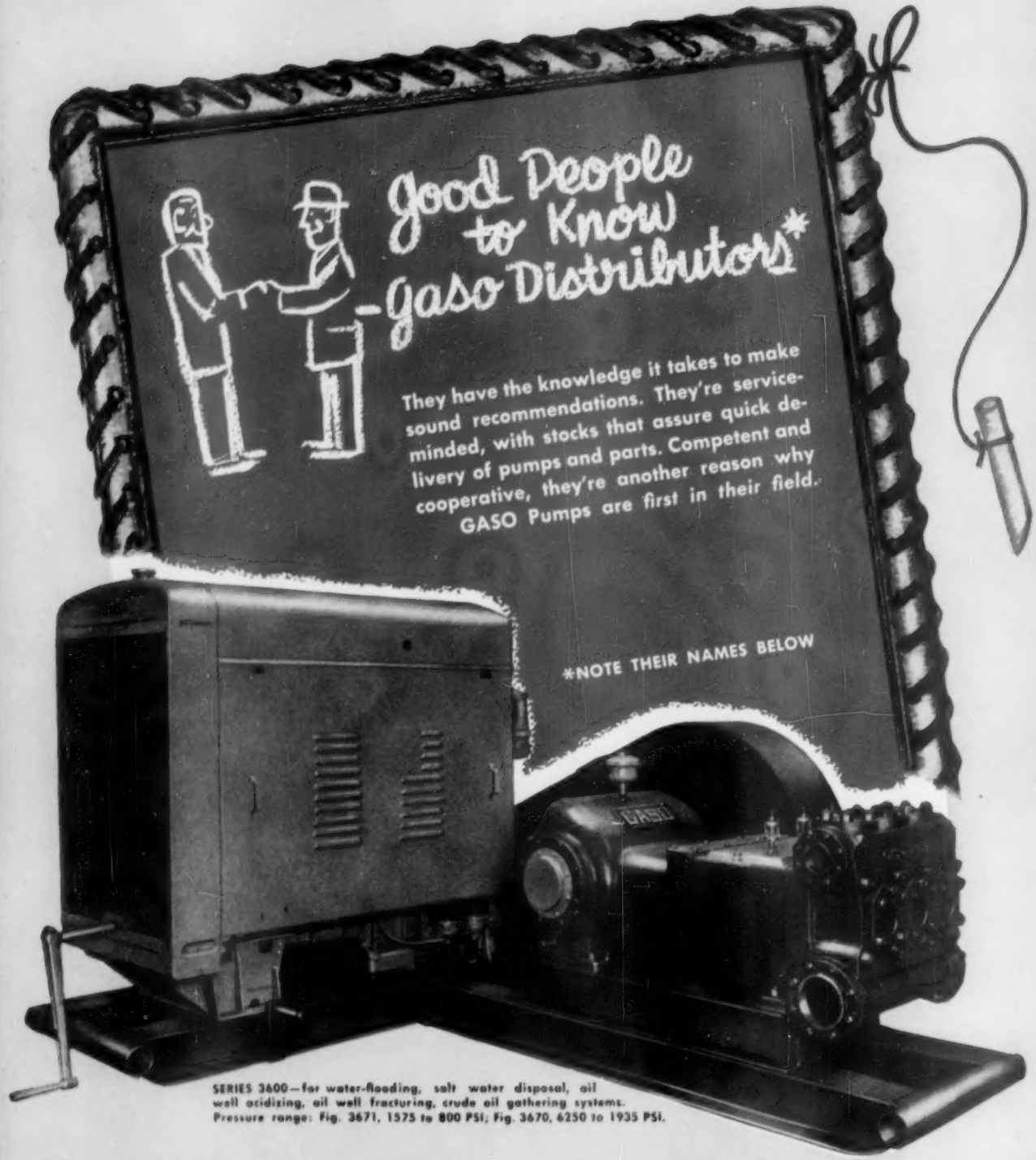
323



LRD SERIES DIESEL
130-350 KW

WRITE FOR BULLETINS FOR THESE AND OTHER MODELS.

WAUKESHA MOTOR COMPANY • WAUKESHA, WISCONSIN *RAILWAY DIVISION*


Good People to Know
-Gaso Distributors*
They have the knowledge it takes to make sound recommendations. They're service-minded, with stocks that assure quick delivery of pumps and parts. Competent and cooperative, they're another reason why GASO Pumps are first in their field.
*NOTE THEIR NAMES BELOW
GASO

SERIES 3600—for water-flooding, salt water disposal, oil well acidizing, oil well fracturing, crude oil gathering systems. Pressure range: Fig. 3671, 1575 to 800 PSI; Fig. 3670, 6250 to 1935 PSI.

GASO PUMP & BURNER MFG. CO.

902 East First Street, Tulsa, Oklahoma

EXPORT OFFICE: 149 Broadway, New York, N. Y.

FIRST IN THEIR FIELD

DISTRIBUTORS

W. L. SOMNER COMPANY, Shreveport, Louisiana • Odessa, Texas • Tinsley, Mississippi • Brookhaven, Mississippi
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PUMP ENGINEERING CO., Wichita Falls, Texas
LUFKIN FOUNDRY & MACHINE CO., Casper, Wyoming
LUFKIN MACHINE CO., Ltd., Edmonton, Alberta

GASO PUMPS
for every oil industry need

GET GASO DEPENDABILITY IN WATER FLOODING, TOO

DARLING

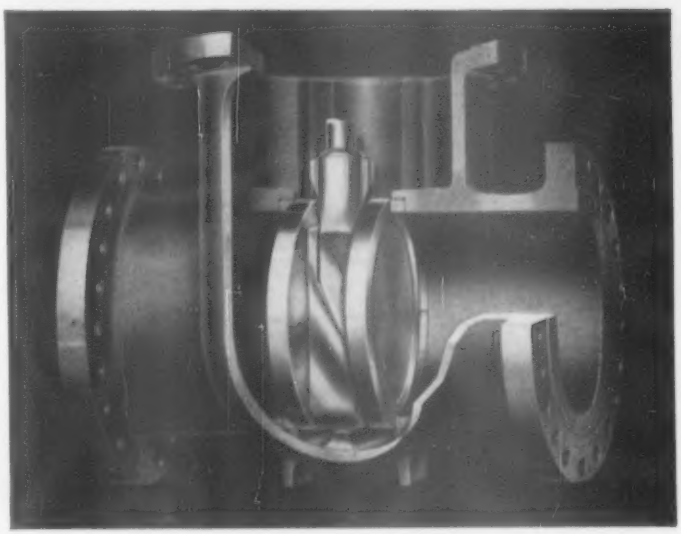
VALVES

What's *SURER* valve performance worth to you?

IN your service, the thing about valves that costs the most is down time. Right? And sometimes even *preventive* measures are pretty costly, too!

All right, here's a fact that Darling gate valve users everywhere will vouch for. The Darling *fully revolving double disc, parallel seat principle* means *easier* operation, *surer* closure, less chance of trouble, month in, month out. And you'll save on maintenance all along.

Why not check into Darling gate valves for your requirements? Find out *how* they assure these advantages. We'll gladly furnish general or specific details. Just say the word.



Above top: Darling 30" motor-operated gate valve powered by gas from line pressure.

Cutaway, below, shows simplicity of Darling's unique fully revolving double disc parallel seat gate valve principle—just four simple working parts—two plain interchangeable no-pocket discs and two husky wedges.

DARLING VALVE & MANUFACTURING CO.

Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

Now a Big 60!

One of the most familiar signs of oil-country activity is the Bethlehem Supply store. Its presence in an oil town is a sure symbol that things are moving fast.

Less than twenty years ago, Bethlehem Supply stores were few and far between. But they're a big family now — a family of 60 units, with more to come. They are in every active field in the western two-thirds of the nation. They cover a vast region extending from Canada to the Gulf Coast; from California to the Mississippi and beyond.

Each of these stores is set up to meet the specialized needs of the area served. Where drilling is predominant in a given field, the Bethlehem store is equipped and stocked accordingly. Likewise, wherever production is active, the store has everything needed in pumping and pipe-line supplies. In refinery areas, stocks and services again reflect the demands of local activities.

"Localized" service is a Bethlehem strong point. This means, of course, that every Bethlehem store has a character of its own. But in one respect, all 60 are alike: they're friendly places, run by friendly people. You'll always find a welcome there. Come in and see!

Near Farmington, N. M. A fine Bethlehem store serves this area.

In the Williston Basin. There's a Bethlehem store close by, at Tioga, N. D.

The Gulf Coast. Bethlehem stores down here are as active as the region itself.

BETHLEHEM SUPPLY COMPANY
General Offices: 21 E. Second St., Tulsa, Okla.

BETHLEHEM STEEL

West Coast Headquarters: Los Angeles, Calif.

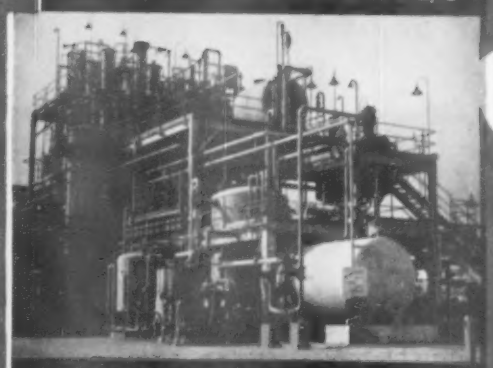
Export Distributor: Bethlehem Steel Export Corporation 25 Broadway, New York, N. Y.

BETHLEHEM SUPPLY

DROP FORGED STEEL

valves, fittings and flanges by Vogt

REFINERIES



CHEMICAL PLANTS

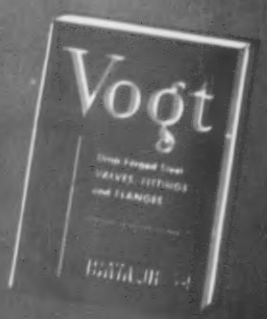
POWER PLANTS

USED and TRUSTED by the NATIONS KEY INDUSTRIES

There are good reasons behind the trust which America's key industries have placed in Vogt valves, fittings, and flanges for half a century. They know that *drop forged materials* are uniform in structure, fine grained, and free from porosity. They know, too, and appreciate the meticulous care given these products through every stage of forging and machining in Vogt's modern shops, and about the many rigid tests and inspections. And that is why these products enjoy such an impressive record of performance in withstanding the shocks and stresses imposed by high or low pressures and temperatures and in resistance to erosive and corrosive conditions.

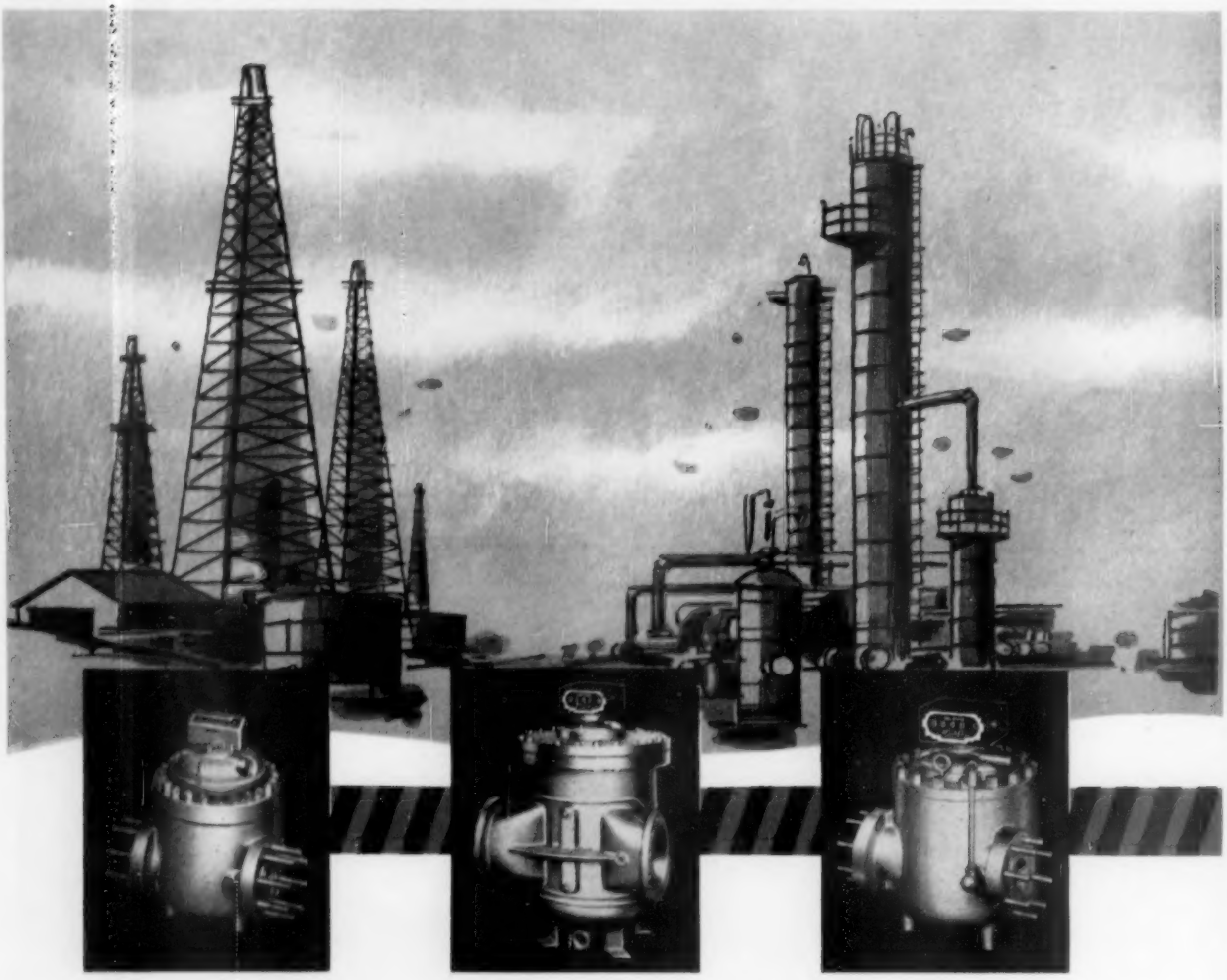
Service is another important factor in this confidence because Vogt maintains the world's largest and most complete stock of drop forged steel valves, fittings, and flanges always ready for immediate shipment.

Write for Catalog 1-B. Consult its 400 pages for the complete Vogt line of drop forged steel valves, fittings, and flanges, with dimensions, weights, etc., that will be helpful to you in specifying.



HENRY VOGT MACHINE CO. LOUISVILLE, KY.

75th Anniversary



High pressure meter Model M-12. M Series meters for working pressures up to 1200 psi.

Line meters. Model B-200, shown, has capacity range 400 to 2000 gpm.

High pressure meter Model D-35. D Series meters for working pressures up to 600 psi.

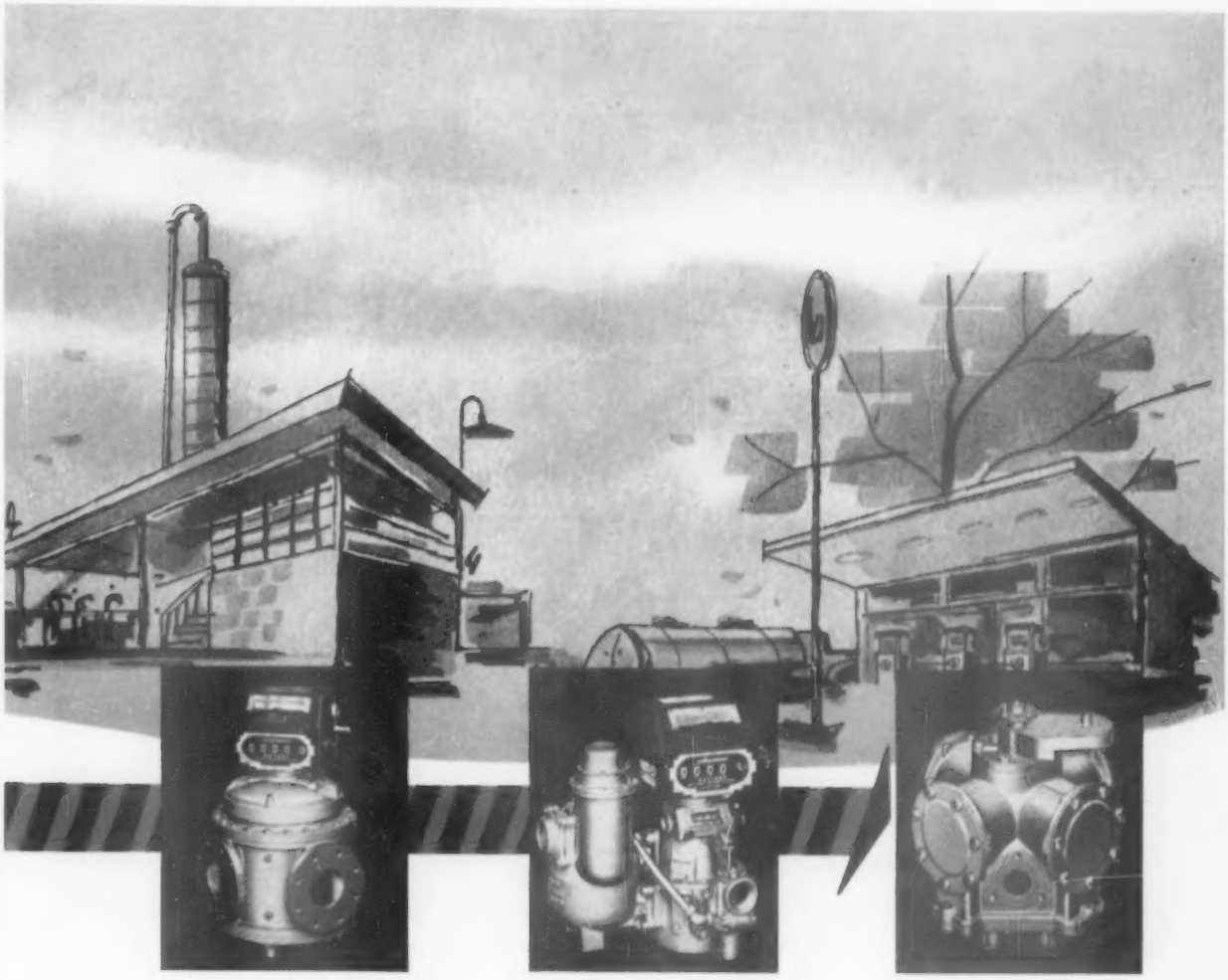
A MILLION BARRELS OF CRUDE

THERE'S AN A. O. SMITH METER

STANDARDIZING on A. O. Smith meters and gasoline dispensers is the most dependable safeguard against loss in your production, processing, delivery and dispensing.

All along the line — from wellsite to service station — you can rely on A. O. Smith meters to give you sustained, uninterrupted measuring accuracy for greater efficiency, highest flow rates. And with simplified hook-up design, fewer fittings are needed — you save time and money on installation.

If you aren't using A. O. Smith products now, it will pay you to get in touch with your nearest representative or write direct. • • •



Line meters. Model AS-50, shown, has capacity range 90 to 500 gpm.

Truck and industrial meters. Model T-10, shown with air eliminator, has capacity range 20 to 100 gpm.

Dispenser pump meter, Model PM-2. Exceptionally accurate, doubly guaranteed.

OR A DOLLAR'S WORTH OF ETHYL . . .

TO ACCOUNT FOR EVERY DROP

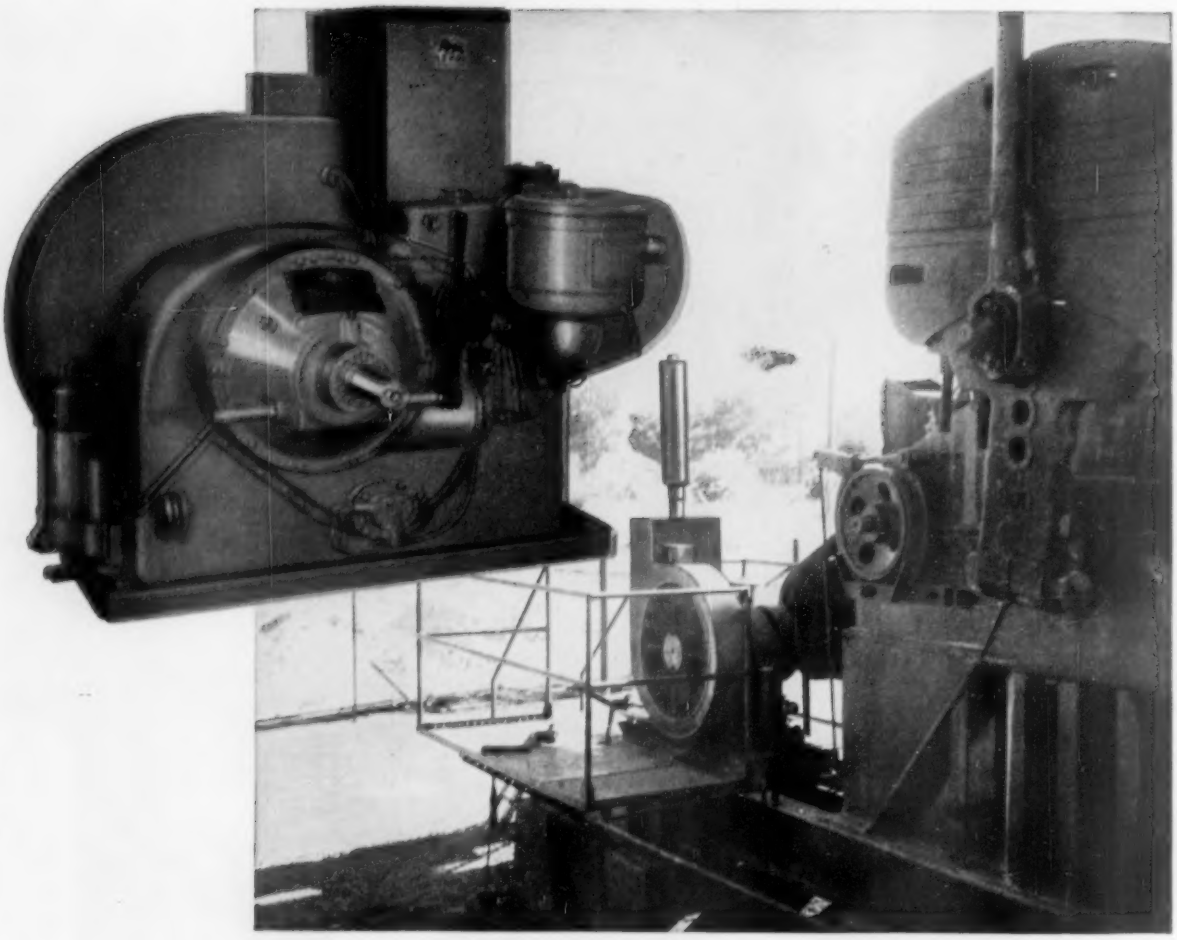
Through research . . . *a better way*

A.O.Smith

CORPORATION

METER PRODUCTS

Factories: 5715 Smithway St., Los Angeles 22, Calif., P. O. Box 500, Succasunna, N. J. Offices: Atlanta, Ga., Chicago 7, Ill., Houston 20, Texas, Los Angeles 22, Calif., New York 17, N. Y. Canada: Toronto 12, Vancouver 1, International Division — Milwaukee 1, Wisconsin



Total Operating Cost Only 1.2 Mills per Hp Hour

. . . that's why it pays to do your pumping with Le Roi A288's

ACCORDING to the major oil company using this 26.3 max. hp A288, this operating cost is lower than that of any of their other engines.

And here are some of the reasons why the A288 cuts the cost of pumping — why it can run two weeks at a time without inspection.

Patented, "vaporizing-condensing" cooling system seldom needs make-up water. Uniform high temperatures reduce corrosion and sludging.

No superfluous acccessories like grease fittings, conventional-type fan and belts to need attention.

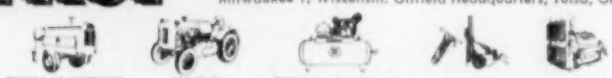
Generous crankcase permits long intervals between oil changes — and no shutdown is required to inspect oil level or add oil.

And performance-wise, you can't beat the A288, or the smaller 14.9 max. hp A114 sister engine, either. One typical installation has more than 47,000 hours on it. Stamina like this is one reason why the A288 is the only pumping engine recommended by a major user for continuous service *unattended for up to two weeks' time.*

Standardize on A288's and watch your pumping costs drop. You can get them from your supply house, or your Le Roi distributor. Or write us for our latest bulletin.

LE ROI *Division of Westinghouse Air Brake Co.*

Milwaukee 1, Wisconsin. Oilfield Headquarters, Tulsa, Oklahoma



P-138

Let this "Visiting Fireman" train your men to fight fire . . . it could save your business

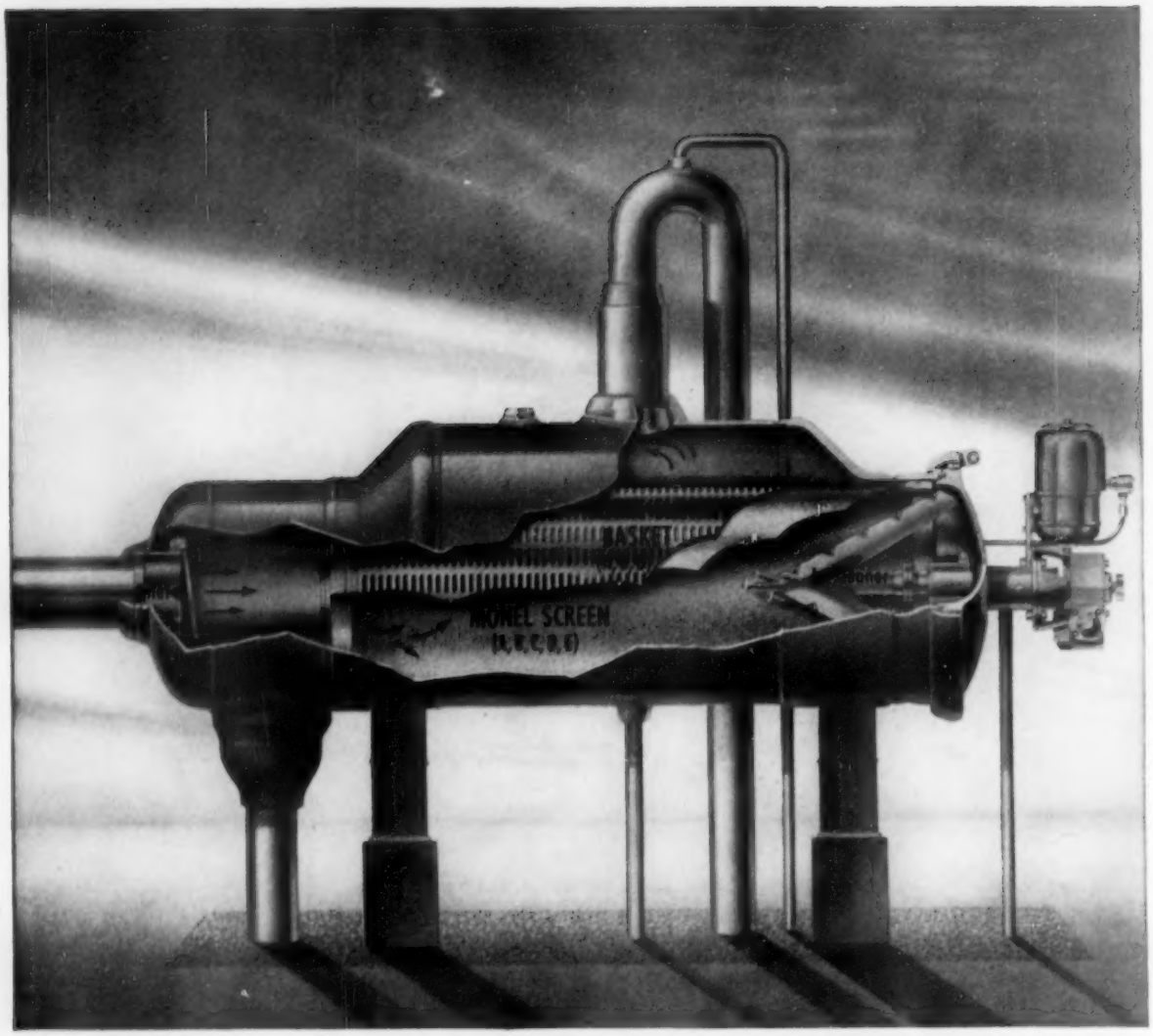
You have a *potential* fire-fighting team right in your plant. These would-be fire fighters *could save your business if fire struck unexpectedly.* All they need is training, the kind that will enable them to respond instantly and properly to any kind of fire emergency.

Ansul can provide this training for a group of your men just as it has for hundreds of its customers. And there will be no charge. It is just one of the "essential" services that Ansul provides for its customers.

Twenty years experience in the fire protection industry has proved to Ansul many times over that all the fire equipment in the world will not save your business *unless* trained hands are available to man that equipment. So, it is important to Ansul that you get *training* along with the fire equipment you buy. Only then will you experience the security that goes with having a complete fire protection program. Only then will you get what you really pay for, what you really need—*complete fire protection.*

You owe it to the life of your business to learn more about Ansul's in-plant fire training service. Get in touch with your local ANSUL MAN through the yellow pages of your phone directory, he will be happy to call on you and explain all of Ansul's customer services in detail. Or write to THE ANSUL CHEMICAL COMPANY, Dept. OG-11, Marinette, Wisconsin.

ANSUL



How Monel improves the Thornhill-Craver strainer

A. Resists corrosives in refined products lines **B.** Retains shape under high pressures **C.** Withstands erosive attack by fast-moving gas-bubbles or moisture particles **D.** Resists wear by entrained solids **E.** Aids slough-off of gummy filtrate

Unique Thornhill-Craver horizontal strainer filters streams pressured to 400 psi. Jet cleaned without dismantling, manually (5 minutes, one man) or automatically. Details from Thornhill-Craver Company, Inc., P.O. Box 1184, Houston 1, Texas.

With Monel* nickel-copper alloy, the Thornhill-Craver strainer is better able to withstand the corrosives found in today's refinery products and intermediates.

Recent inspections revealed no deterioration of Monel parts after 4½ years.

Monel and other Inco Nickel alloys are used in thousands of locations and many different types of drilling, production and refining equipment. *They have proven uniquely resistant to corrosion, and well able to meet a wide range of severe physical requirements.* For assistance in their application, contact Inco's Development and Research Division.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

INCO TRADE MARK **NICKEL ALLOYS**

*Registered trademark

THE HOTTER THE BETTER

FOR HALLIBURTON'S

POZMIX 140

CEMENT

As drill bits bite deeper, holes get hotter and pressures go higher, a cement is needed that will stand the heat. That's Halliburton's POZMIX 140 – the cement for well completions *above* 140° F... *a radically different cement that does a remarkably better job.*

Tailored for "Hot Tempered" Wells

Pozmix 140 is composed of pozzolanic materials combined with hydrated lime and set control additives. After years of research, Halliburton developed these formulations to suit the most difficult well conditions... to give them longer pumpability for deep well cementing... by controlling thickening time.

Retains Strength Under High Temperature and Pressure

When set, POZMIX 140 is a totally reacted material. It is highly resistant to leaching attack by underground waters. It has been found to be uniform in its chemical and physical behavior. It meets or exceeds specifications for thickening time and strength for deep well cements.

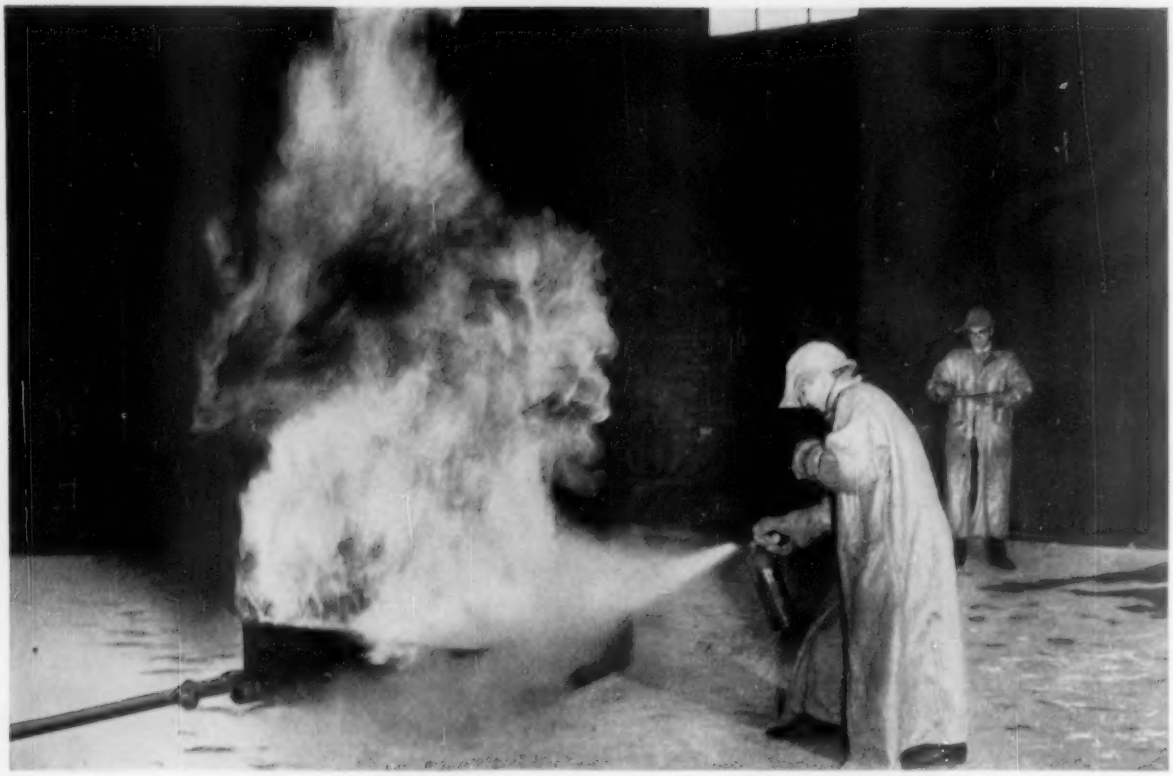
Lower friction coefficient, controlled thickening time, proper compressive strength, resistance to corrosion and ability to stand the heat are just a few of the extra advantages you get with POZMIX 140. And you get them all in a *better* job that actually costs *less*. Your Halliburton operator has all the facts and figures. Call your local or district office of the Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

COMPLETE DATA SENT ON REQUEST

Get this valuable information for your Halliburton Service File

HALLIBURTON CEMENTING SERVICES

251 SERVICE CENTERS – JUST MINUTES AWAY FROM ANY RIG



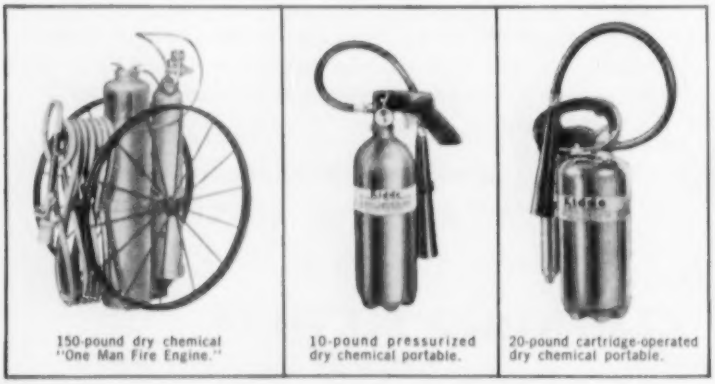
OPERATION POOF!

Kidde Dry Chemical Extinguishers prove fatal to oil fire in independent laboratory test!

An oil and gas mixture was set ablaze under actual test laboratory conditions. Using a Kidde 5-pound portable Dry Chemical Extinguisher, trained firefighters snuffed out the flame before it could spread!

Kidde spends years of research and thorough testing of all its dry chemical extinguishers to insure the greatest fire protection possible. Result: Kidde exclusives like the patented *diffuser horn* to give a wider coverage than ordinary dry chemical extinguishers...easier-maneuvering units...and *trigger-finger grips* for quicker, easier handling even in the hands of inexperienced operators.

You should know how best to protect *your* property from fire. Find out more about the complete Kidde dry chemical line by writing for Kidde's P-8 Extinguisher Catalog today.



150-pound dry chemical "One Man Fire Engine."

10-pound pressurized dry chemical portable.

20-pound cartridge-operated dry chemical portable.

Kidde

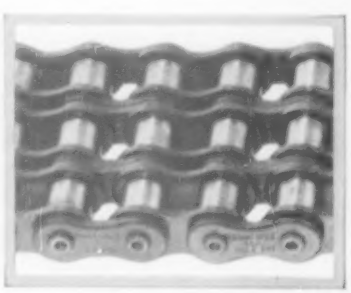
Walter Kidde & Company, Inc.
1055 Main Street, Belleville 9, N. J

Walter Kidde & Company of Canada Ltd.
Montreal — Toronto

You need accurate pitch control in roller chains, too...

To provide the long service life you need from your drilling chains, Rex Roller Chains are manufactured with a revolutionary system of pitch control. The working load is distributed equally over all parts. No chance for the load to be concentrated on a single side plate with consequent early failure of the plate. The extremely accurate tolerances maintained...the complete balance of strength between parts...assure you longer service life and far less rig down time; and the "glide fit" of the pins assures easy assembly and disassembly.

For your cost's sake, investigate the chains with revolutionary pitch control—Rex Roller Chains...there's no better chain made! See your local supply store, your Rex® Field Sales Engineer, or write for your copy of Oil Field Catalog No. 55-3. CHAIN Belt Company, 4619 W. Greenfield Avenue, Milwaukee 1, Wisconsin.



CHAIN BELT COMPANY

MILWAUKEE 1, WISCONSIN

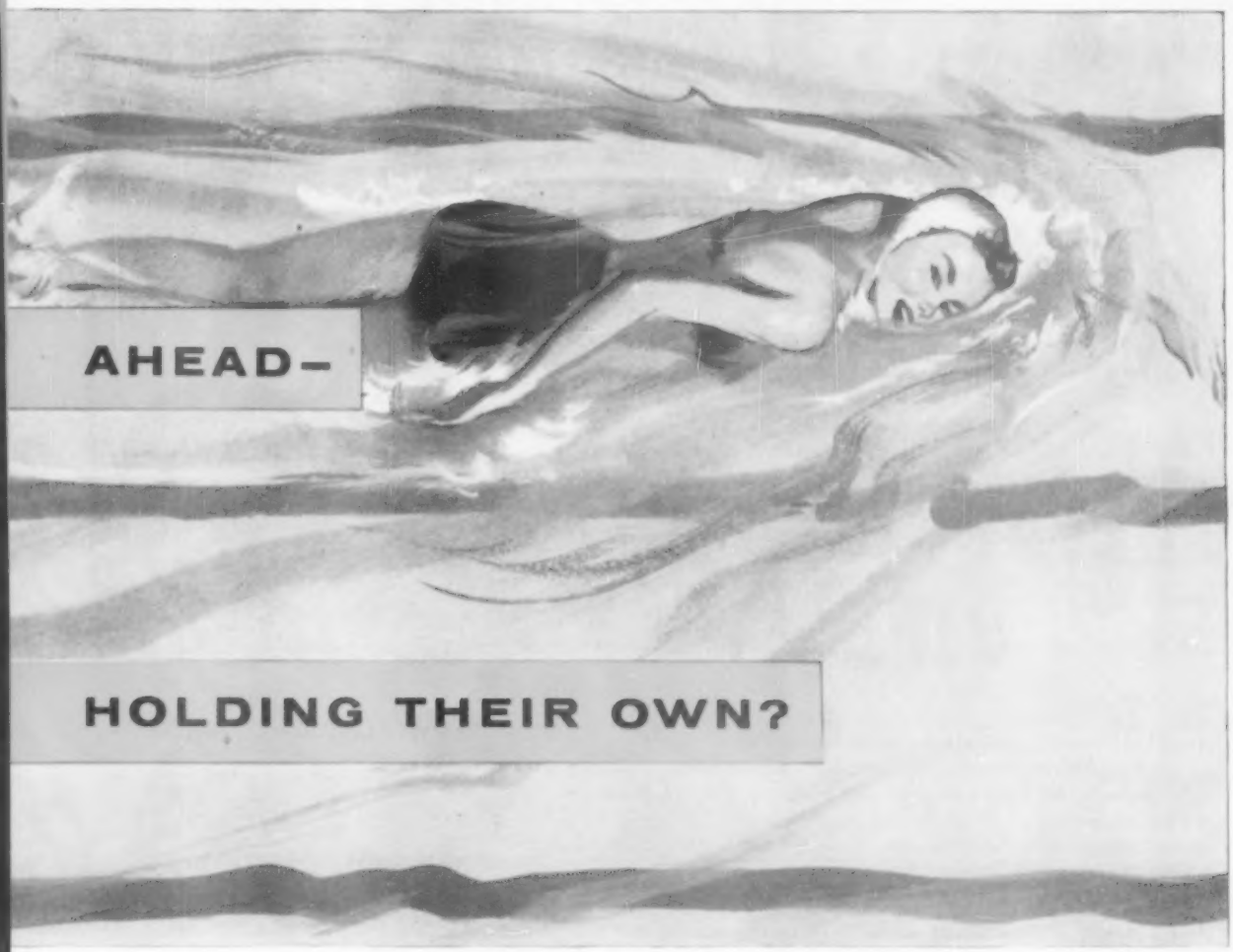
OIL FIELD DISTRICT OFFICES IN: TULSA • DALLAS • HOUSTON • MIDLAND • LOS ANGELES • NEW YORK

Today's constantly increasing demand for higher octane gasolines poses a challenge to every refiner. If you do not meet this demand efficiently and economically you may very well forfeit your competitive position in the race for the motorist's dollar.

So, look to your pool octanes. You need to make sure that your refining processes provide maximum quality to *every* gallon of gasoline produced. And this just can't be done with one high octane stream. It requires an improvement of the poorer quality blending components that lower pool gasoline octanes.

This is why UOP has devoted much of its research toward the up-grading of the poorest quality components that go to make up the finished gasoline pool.

An important result of this work is Universal's latest refining process—PENEX. This new process offers an efficient and practical method of up-grading pentane and hexane fractions, the previously neglected components that can so adversely affect the octane ratings of your pool gasoline.



In the race for higher octanes, you cannot afford to forget that the goal is to improve the general quality of your pool gasolines. PENEX offers a means of accomplishing this practically and economically. It should be given immediate consideration in your planning.

UNIVERSAL OIL PRODUCTS COMPANY

30 Algonquin Road, Des Plaines, Illinois, U. S. A.

Forty Years Of Leadership In Petroleum Refining Technology

PENEX

TRADEMARK

A new isomerization process for up-grading pentane and hexane fractions

When the Pressure is on—Specify

ALCO

PREFABRICATED PIPE

ALCO has recently added a new, modern prefabricated pipe plant to its manufacturing facilities. As a result, ALCO is better equipped than ever to supply these products to the power, refinery and chemical process industries. To this new facility, ALCO has applied its wealth of engineering experience, production know-how and high standards of inspection and testing. Thus customers are assured of highest quality.

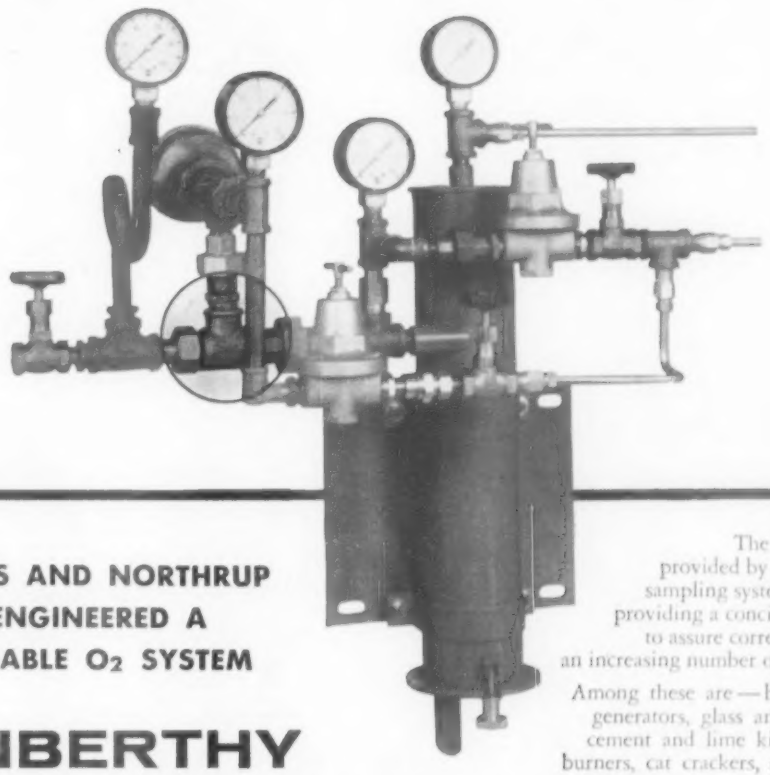
For complete details on ALCO prefabricated piping, call the nearest ALCO Sales Office. Your inquiry will be given prompt attention whether you need piping next week, next month or next year.

ALCO PRODUCTS, INC.

Prefabricated Pipe Products

MOSTELLER ROAD • P. O. BOX 181
CINCINNATI 15, OHIO

TO STOP DOLLARS *from* GOING UP THE FLUE...

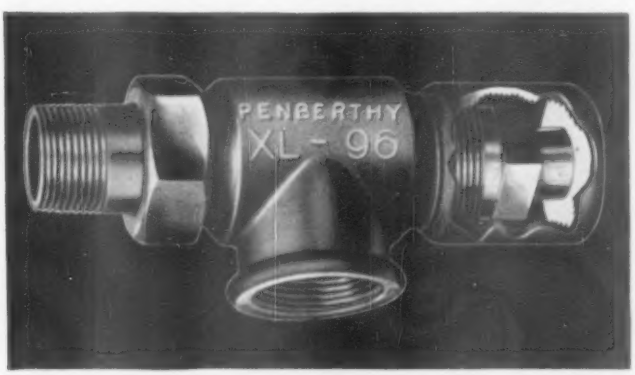


LEEDS AND NORTHRUP ENGINEERED A RELIABLE O_2 SYSTEM

The high-speed flue gas sample provided by L & N's new steam-operated sampling system is instrumental in providing a concise and reliable O_2 picture to assure correct combustion conditions in an increasing number of industrial applications.

Among these are—boilers, atmosphere generators, glass and open hearth furnaces, cement and lime kilns, hydroformers, SO_2 burners, cat crackers, and fluid coke units.

PENBERTHY PROVIDED A POWERFUL PUMP *in a small package*



In moving stack gas to the analyzer . . . the Penberthy Ejector offers practical advantages over mechanical pumps. Smaller, more compact and less costly, it is assembled as an integral part of L. & N's equipment. It is not subject to mechanical failure (no moving parts) and has high corrosion resistance.

LOCAL JOBBER SUPPLIED INITIAL UNITS

Like L & N, you, too, will find that leading supply companies carry a complete line of standard Penberthy Ejectors suitable for most pumping applications. For special jobs or detailed technical information, write direct.

PENBERTHY MANUFACTURING CO.
Division of Buffalo-Eclipse Corporation
1242 Holden Avenue Detroit 2, Michigan

There's Certain Satisfaction in **PRODUCTS BY** PENBERTHY

- GAGES
- EJECTORS
- EDUCTORS
- EXHAUSTERS
- SYPHONS
- ELECTRIC SUMP PUMPS
- CYCLING JET PUMPS
- INJECTORS

The combination of durability, deep penetrating action and fast cutting speeds makes CP

Three Cone Rock Bits the favorite of drilling rig operators everywhere. Available in seven different types, there's a CP bit for every kind of formation from soft to exceedingly hard and abrasive. For more details write Oil Tool Division, Chicago Pneumatic Tool Company, 5000 U.S. Highway 81 So., Fort Worth, Texas.

Chicago Pneumatic

GENERAL OFFICES: 8 East 44th Street, New York 17, N. Y.
IN CANADA: 10103 81st Ave., So. Edmonton, Alberta, Canada
IN MEXICO: D. R. Rosas Morena No. 41, Mexico City, D. F., Mexico
PETROLEUM MACHINERY CORPORATION: 30 Rockefeller Plaza, New York 20, N. Y.
(Export Agent, exclusive of Mexico and Canada)

THREE CONE BITS • REAMING BITS • REAMERS • DRILL COLLARS • TOOL JOINTS • SUBS • JUNK BASKETS

J&L adds a Gulf Coast Store at
MORGAN CITY, LA.

B. E. TRISLER, Morgan City Store Manager, formerly Manager of the J&L store in Lake Charles, La.

In the Gulf Coast area of Louisiana, where the Acadian tongue is as common as English and the shrimp boats ply their ancient trade in sight of man's most modern achievements in drilling for oil, J&L Supply has opened a sixth store, this time at Morgan City.

As in the case of all other J&L stores in the United States and Canada, the Morgan City plant is manned and stocked to meet requirements peculiar to its locale.

The new store brings J&L service facilities (stores, sales offices, and district offices) to a total of one hundred and twenty-six.

Above, left to right: LORAN W. TODD, Sales Representative, formerly with the J&L store in Houma, Louisiana. G. E. BENDER, W. L. HERRINGTON, P. T. HUDDLESTON, and O. R. ROBINSON, Storemen.

New J&L store at Morgan City, on Highway 90, about one mile east of the City limits. (Wyandotte Subdivision.)

CLARENCE E. ROGERS, District Sales Manager, Louisiana Gulf Coast District, headquartered at New Orleans.

Jones & Laughlin

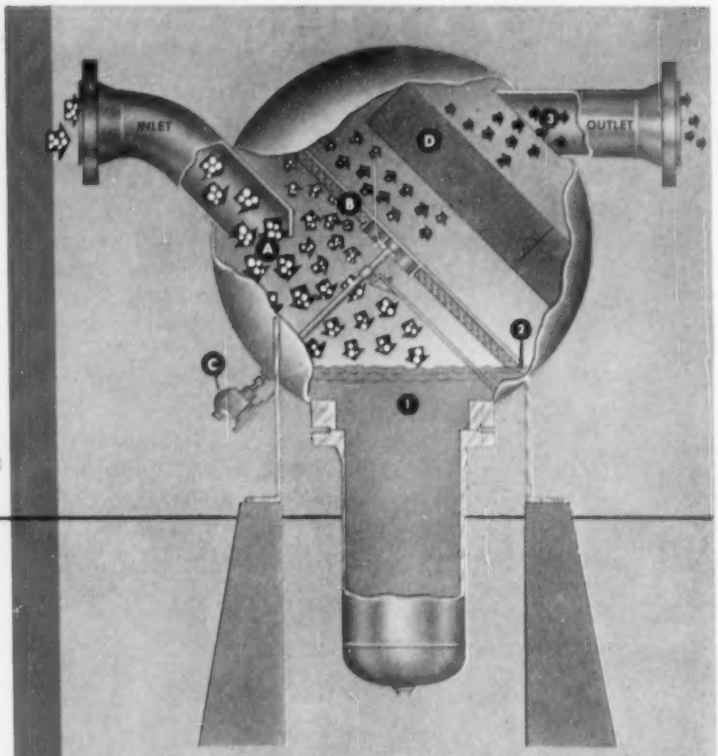
SUPPLY DIVISION – Tulsa

SERVING THE UNITED STATES AND CANADA

MORE EFFICIENT RESULTS!

PEERLESS SCRUBOSPHERE*

*Spherical scrubber for dust and liquid removal from gas flow

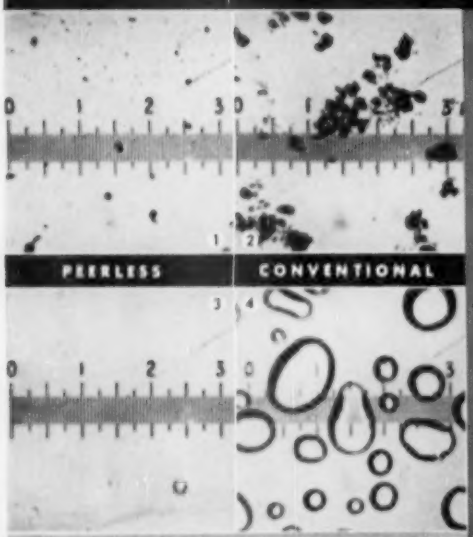


(A) The majority of incoming liquid and solid particles are directed down into reservoir. 1

(B) Lighter solid particles carried by gas stream are separated on surfaces of contactor which are kept wet and clean by revolving through liquid reservoir. 2

(C) Contactor is revolved by explosion-proof gear motor.

(D) Mist Extractor removes any remaining liquid particles from gas stream prior to outlet. 3



These photographs were made of microscope slides introduced downstream of the Scrubosphere and a conventional vertical oil bath cleaner under the same operating conditions. Plates 1 and 2 show the comparative amounts of iron oxide not removed with the amounts introduced being identical. Plates 3 and 4 indicate comparative oil loss with vapor rate through the vessels being the same.

LOOK AT THIS TEST The test at the left indicates the superiority of Peerless Scrubosphere over conventional oil bath dust scrubbers. The SCRUBOSPHERE operates with no loss of efficiency at low flows, minimum liquid loss, and very low pressure drop. Other outstanding features include easy vessel access with removable self-cleaning contactor, a sump for slugs of solid or liquid particles, and minimum cost.

For detailed information write for Bulletin No. 180

PEERLESS MANUFACTURING CO.

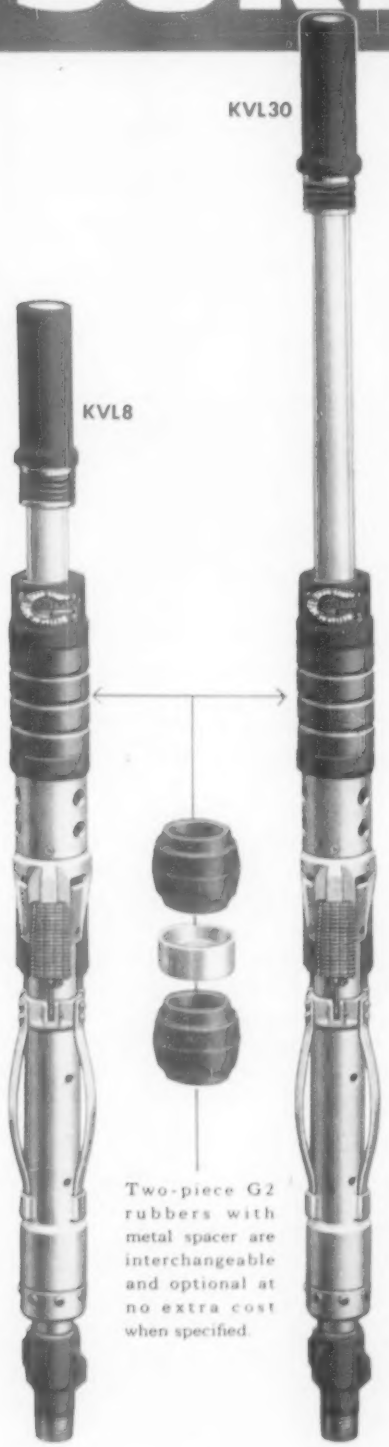
P.O. Box 13165 Dallas, Texas

Representatives in All Principal Cities

PEERLESS MFG. CO. DALLAS TEXAS

SAFE and SURE

GUIBERSON'S KVL PACKERS



Two-piece G2 rubbers with metal spacer are interchangeable and optional at no extra cost when specified.

With Automatic Latch

Operators who want extra assurance that a packer won't come unlatched going in, depend on Guiberson KVL packers. Rugged and durable, KVL packers have earned a reputation for dependable performance in deep and medium depth wells. These retrievable packers are easy to set and release, with ample bypass and positive seal. When running into a liner the KVL stays latched and drag springs provide an excellent guide — features operators like. For conserving gas energy and increasing production in flowing wells; for completing wells by circulation; for acidizing, repressuring and dozens of other uses, the KVL is unsurpassed.

- Made as the KVL30 with 30" valve stroke or KVL8 with 8" valve stroke for standard below-packer circulation. (Both packers also made with perforated mandrel for circulation above packer.) Available in casing sizes 5" through 9⅝".
- Valve has two independent sealing elements, a tapered metal valve and seat and a set of oil-resistant seal rings, affording double-sealed protection.
- Rubbers made of special oil and gas resistant compound. Will not vulcanize to casing — recover original shape when released.

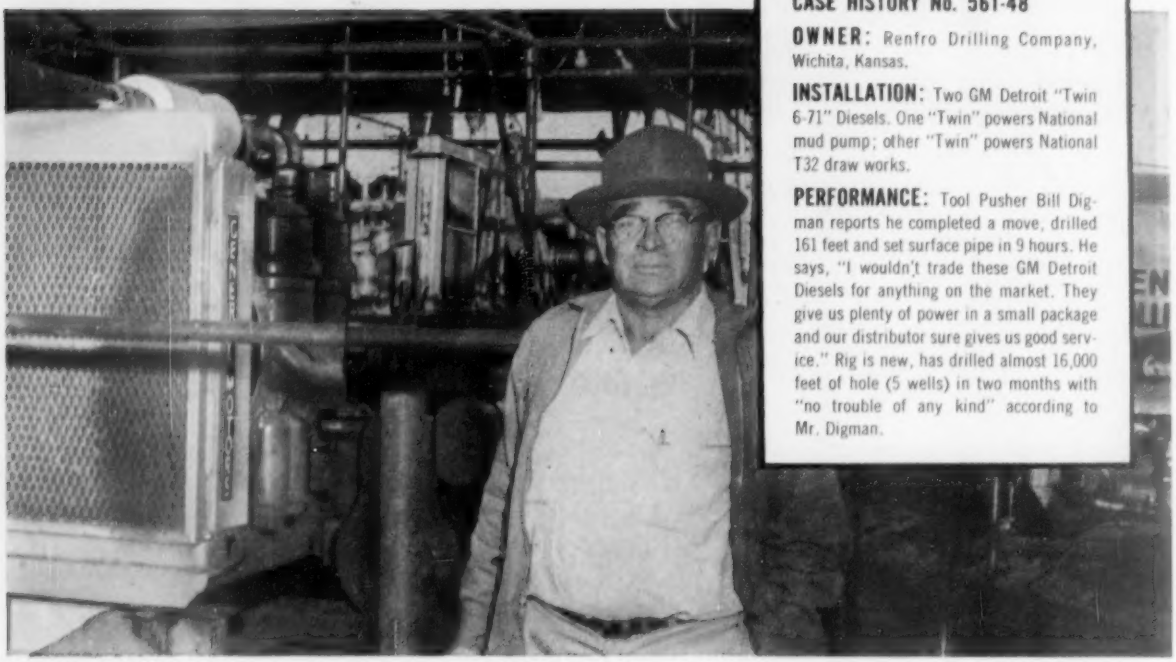
THE GUIBERSON CORPORATION

ESTABLISHED 1919
DALLAS, TEXAS
U. S. A.

Sold by
Oil Field Supply Stores
Everywhere

Makes Move—Drills 161 Feet—Sets Surface

ALL IN 9 HOURS



GM DETROIT DIESEL
CASE HISTORY No. 561-48

OWNER: Renfro Drilling Company, Wichita, Kansas.

INSTALLATION: Two GM Detroit "Twin 6-71" Diesels. One "Twin" powers National mud pump; other "Twin" powers National T32 draw works.

PERFORMANCE: Tool Pusher Bill Digman reports he completed a move, drilled 161 feet and set surface pipe in 9 hours. He says, "I wouldn't trade these GM Detroit Diesels for anything on the market. They give us plenty of power in a small package and our distributor sure gives us good service." Rig is new, has drilled almost 16,000 feet of hole (5 wells) in two months with "no trouble of any kind" according to Mr. Digman.

JIMMY DIESEL'S MAINTENANCE TIPS

Your GM Detroit Diesel is built to stay on the job day in and day out for a lifetime of hard work. You'll get even better service from your engine if you have your GM Detroit Diesel distributor or dealer set up a preventive maintenance program for you. Call him today, and remember—Preventive Maintenance Doesn't Cost, It Pays.

YOU SPEND more time drilling—less time moving—with a General Motors Detroit Diesel on your rig because this 2-cycle Diesel packs more power in a smaller, lighter engine that lets you make faster, easier moves usually without special road permits.

And with a GM Detroit Diesel you make hole faster, too. For its snappy 2-cycle operation with power on every piston downstroke gives you action *right now* when the driller hits the throttle. That means faster round trips, more time on bottom, quicker hole completion wherever you're drilling.

Your local GM Detroit Diesel distributor or dealer can give you full details on GM Detroit Diesel power for your drilling rigs—or for servicing or fracturing units. See him today or write direct for more information.

Single Engines . . . 30 to 300 H.P. *Multiple Units . . . Up to 893 H.P.*

DETROIT DIESEL

GM DIESEL POWER

Engine Division of General Motors
Detroit 28, Michigan

America's Largest Builder of Diesel Engines

GENERAL MOTORS CORP., DIESEL ENGINE SALES, PETROLEUM INDUSTRY, 1504 PHILTOWER BLDG., TULSA, OKLAHOMA

ALABAMA—Birmingham, Montgomery
ARMSTRONG EQUIPMENT CO.

CALIFORNIA—Berkeley
WEST COAST ENGINE & EQUIPMENT CO.
El Monte, Long Beach, Los Angeles
ANDERSON-O'BRIEN CO.

COLORADO—Denver
THE COLORADO BUILDERS' SUPPLY CO.

ILLINOIS—Mt. Carmel
WESTERN SERVICES, INC.

KANSAS—Great Bend, Wichita
DIESEL EQUIPMENT CO., INC.

LOUISIANA—Shreveport
UNITED ENGINES INC.
Harvey
GEORGE ENGINE CO., INC.

MICHIGAN—Detroit
PENINSULAR DIESEL, INC.

MISSISSIPPI—Jackson
TAYLOR MACHINERY CORP.

MISSOURI—St. Louis
WESTERN MACHINERY & ENGINE CO.

NEW MEXICO—Albuquerque
HARRY CORNELIUS CO.

NORTH DAKOTA—Williston
GENERAL DIESEL AND EQUIPMENT CO.

OKLAHOMA—Oklahoma City, Tulsa
DIESEL POWER CO.

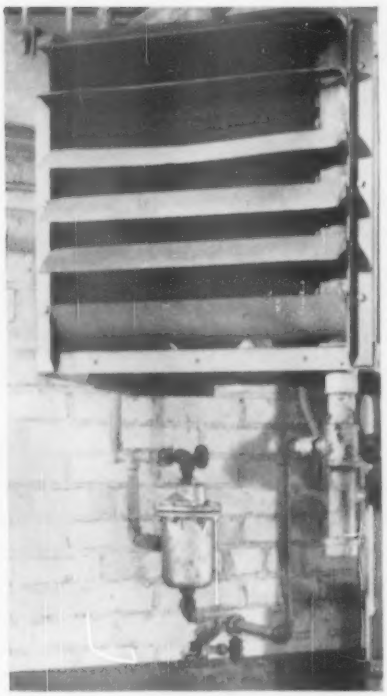
TEXAS—Corpus Christi, Dallas, Houston, Lubbock, Odessa, San Juan
STEWART & STEVENSON SERVICES, INC.

UTAH—Moab, Salt Lake City
CATE EQUIPMENT CO., INC.

WYOMING—Casper
THE COLORADO BUILDERS' SUPPLY CO.

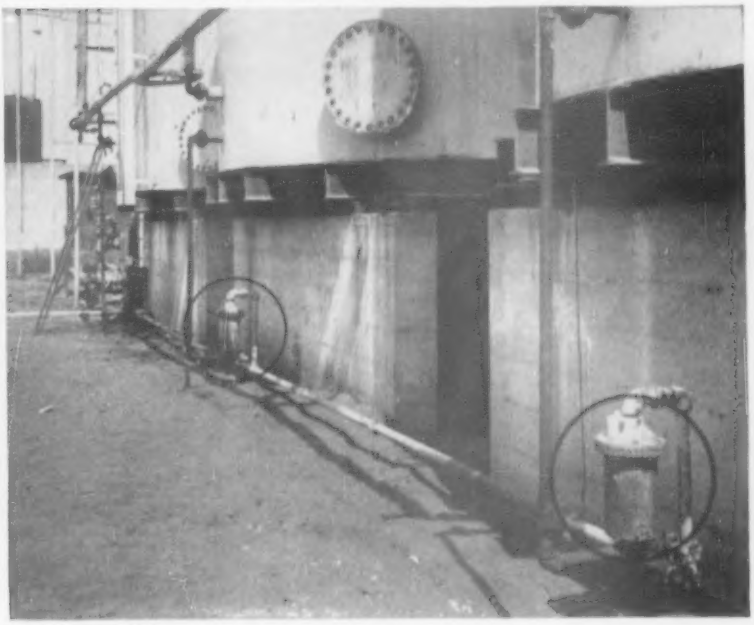
IN CANADA—Distributors in all key locations, under
GENERAL MOTORS DIESEL LIMITED
London, Ontario

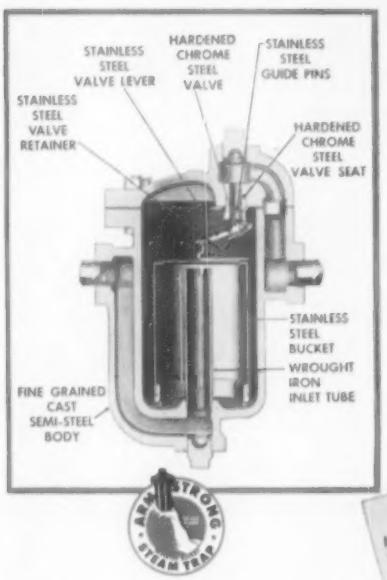
Major Chemical Company Reports Armstrong Traps Cost Less to Maintain



INDOORS—Mr. George Gentes, Works Manager at Hooker Electrochemical Co., Tacoma, Wash., says, "We feel that we get excellent service with Armstrong traps. We have been using them for about 10 years."

OUTDOORS—these Armstrong traps give year 'round service at Hooker's big Tacoma plant.




STAINLESS STEEL VALVE LEVER
HARDENED CHROME STEEL VALVE
STAINLESS STEEL GUIDE PINS
STAINLESS STEEL VALVE RETAINER
HARDENED CHROME STEEL VALVE SEAT
STAINLESS STEEL BUCKET
WROUGHT IRON INLET TUBE
FINE GRAINED CAST SEMI-STEEL BODY
ARMSTRONG STEAM TRAP

Simple, dependable Armstrong traps mechanisms have only two moving parts—bucket and lever. Design, materials and workmanship in low and medium pressure traps identical to that of traps for 900 lbs., 900°F service!

Trap's Lot is a Hard One. A steam trap takes a lot of punishment. On some jobs it may operate *1,000,000 times a year*. The parts are subjected to dirt, scale and corrosive substances, high temperatures and the erosive action of the condensate.

Armstrong's Take it Well. Armstrong traps endure these conditions remarkably well. In reporting on less trap maintenance since installing Armstrong traps Mr. George Gentes, Works Manager of Hooker Electrochemical Company's plant at Tacoma, Washington stated:

"We get excellent service . . . our trap maintenance cost is very low."

Others Agree. More Armstrong customers mention low maintenance than any other single benefit. That means more than low repair costs. It means freedom from leaky traps that waste steam, freedom from faulty traps that slow up production—freedom from *trouble*.

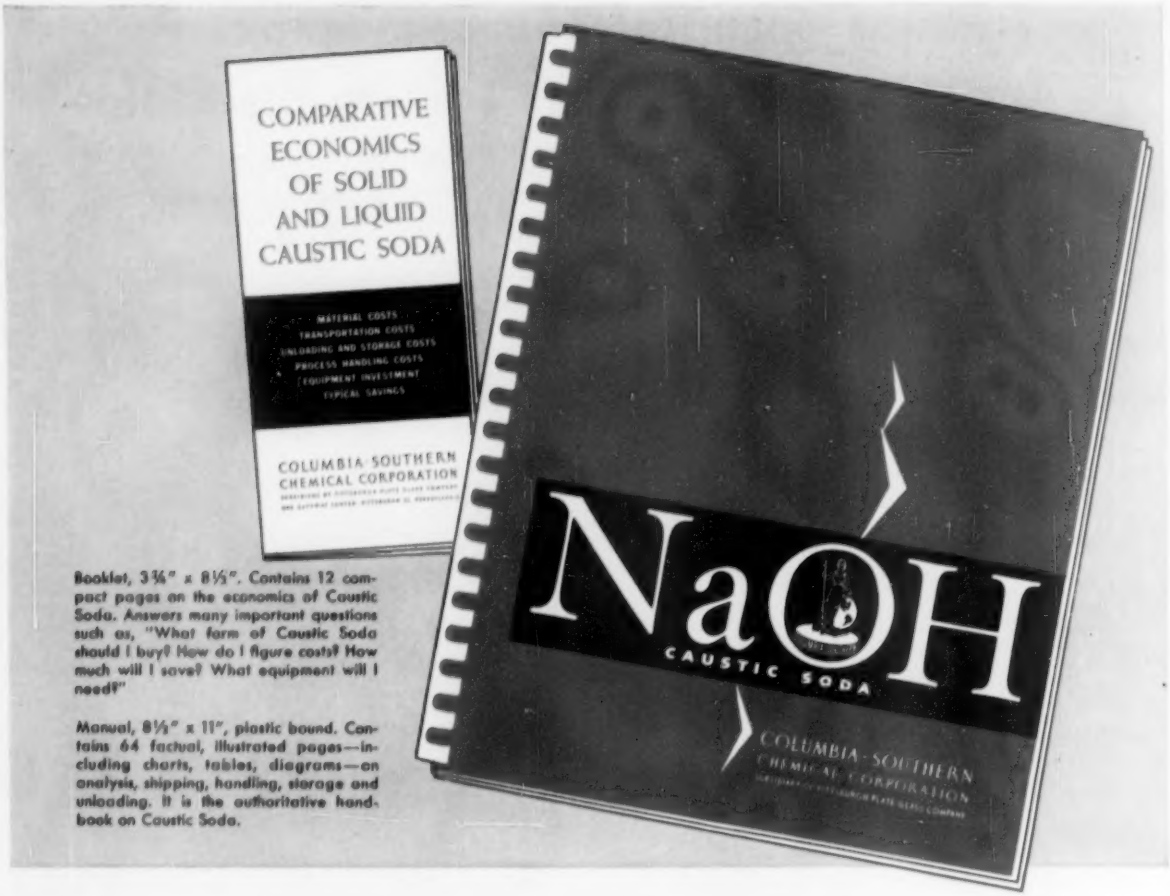
A Suggestion. Send for the Armstrong Catalog listed below or, better yet, call your local Armstrong Representative or Distributor—he's exceptionally well qualified to help you improve your trapping situation.

ARMSTRONG MACHINE WORKS
868 Maple Street • Three Rivers, Michigan

FREE
44-PAGE STEAM TRAP BOOK—Send for yours—no obligation.

ARMSTRONG MACHINE WORKS
868 Maple Street, Three Rivers, Michigan
Please send Steam Trap Book to:

Name_____
Company_____
Address_____
City_____ Zone___ State_____



Booklet, 3¼" x 8½". Contains 12 compact pages on the economics of Caustic Soda. Answers many important questions such as, "What form of Caustic Soda should I buy? How do I figure costs? How much will I save? What equipment will I need?"

Manual, 8½" x 11", plastic bound. Contains 64 factual, illustrated pages—including charts, tables, diagrams—on analysis, shipping, handling, storage and unloading. It is the authoritative handbook on Caustic Soda.

Do you have these two valuable books on caustic soda?

If your work involves the handling, use, purchasing, or economics of Caustic Soda, and you do not have these books, you are urged to write for your free copies today. Ask for "Caustic Soda Manual" or "Caustic Soda Economics Booklet." If you want both, please specify. Please use company stationery and send your request to Columbia-Southern Chemical Corporation, One Gateway Center, Pittsburgh 22, Pennsylvania.

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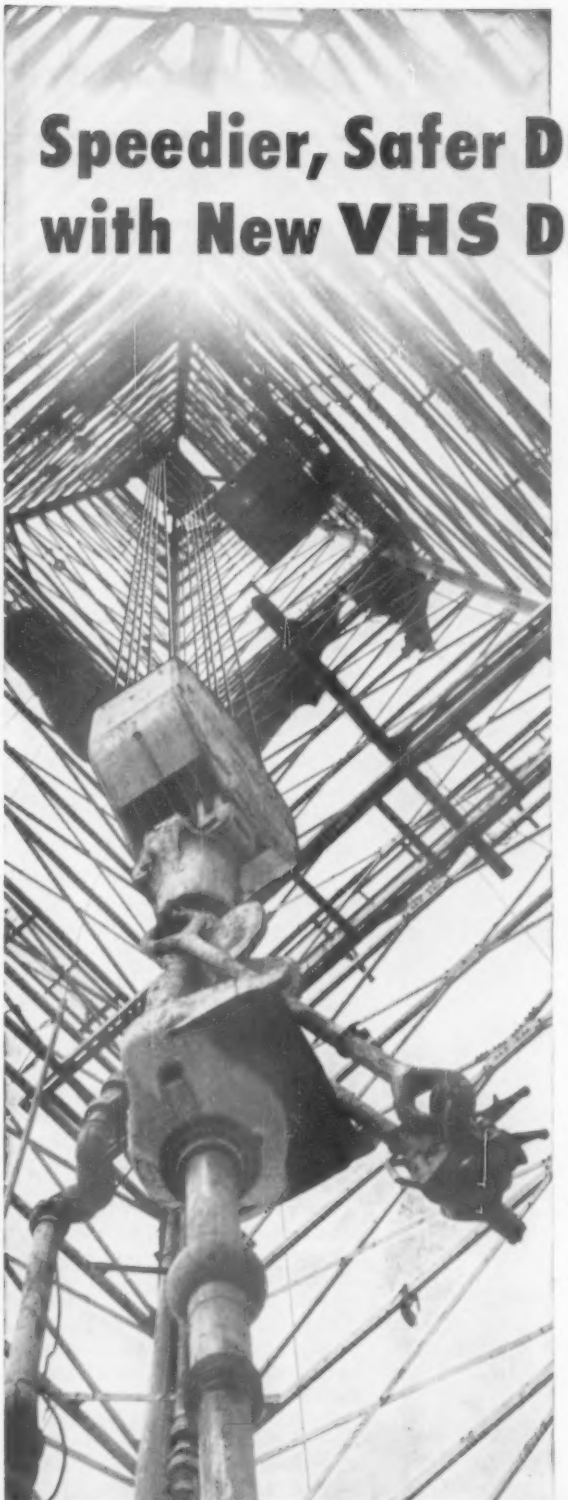
Speedier, Safer Drilling— with New VHS Drilling Lines



• More and more operators are getting faster, safer drilling with rotary drilling lines of new LAY-SET VHS. For new VHS is at least 15% stronger than Improved Plow Steel—the strongest grade available before VHS.

DRILL DEEPER

This extra strength means you can drill deeper before increasing the number of parts of line. You can make round trips faster. And VHS's extra strength eliminates in many cases any necessity for buying new blocks or regrooving sheaves to use larger diameter lines for higher safety factor.

HIGHER SAFETY FACTOR

The safety factor for 10 lines of new LAY-SET VHS is equal to that for 12 lines of IPS. Or, with 10 lines of VHS the safety factor is about 14.9, or 15%, higher than with 10 lines of IPS.

TOUGHER, TOO

A new VHS is tougher. It has greater resistance to abrasion and higher resistance to peening—both important factors in maintaining shape and diameter. Following regular, adaptable cut-off practices should result in ton-mile advantages.

WINCH LINES, TOO

Now new LAY-SET VHS is available in winch lines—where its extra strength and toughness pay big dividends.

Call your Hazard distributor for rotary drilling lines or winch lines of new LAY-SET VHS. Just tell him the size and diameter you want—no complicated specifications are necessary.

for further information write to the nearest Hazard office for Brochure DH-522

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Remarkably simple in design and construction, Type C valves can be used for continuous or intermittent flow, they can be used in dual completions, they are adaptable to permanently-completed wells, they can be adapted for casing flow, and certain sizes can be installed without pulling tubing.

A resilient rubber sleeve is the only moving part, and extremely small opening and closing differentials are possible, even with sand-laden fluids. The valve is built *around* a full-opening mandrel (rather than alongside the tubing) which affords greater strength than the tubing itself. The check seals positively and does not require velocity to close. When used in an intermittent operation, a minimum amount of gas is required to lift the load of fluid, regardless of surface choke settings or long flow lines.

The Type C Otis Gas Lift Valve has so many significant advantages that we believe it has advanced gas lift technology by at least ten years. Ask an Otis man why.

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They Say—

Iran's Suez Stand

"Throughout the Suez crisis the Persian Government has responded steadily and clearly. The reason for Persia's attitude is not far to seek. Mr. Ardalan (Iranian foreign minister) expressed it succinctly when he said that the present situation was more serious for countries east of the canal than for those west of it. No country, indeed, is more dependent on the efficient functioning of the canal than Persia.

"Oil is by far the most valuable of Persia's exports, and—since, unlike Iraq and Arabia, she has no pipeline to link her oil fields with the Mediterranean—the bulk of her oil, excepting what is required by countries farther east, is shipped through the Suez Canal . . . All the same, it has required courage on the part of Persia's rulers to pursue so consistent a policy—just as earlier it required courage to give loyal support to the Baghdad Pact."

Editorial in the London Times.

How Adena Agreement Was Made

Dear Sir:

It is my recollection that when we (Colorado Oil and Gas Commission) made an order allocating production in the Adena field, you will remember that we allocated production on the basis of recoverable oil in the ground. It was said, I think, in your Journal and elsewhere, that this is the first time that such a basis had been used for the purpose indicated. However, that may be, the order we made was followed by suit against the commission by Petroleum, Inc., to invalidate our order.

But more recently, the suit has been dismissed and the parties have made an agreement for complete unitization. They tell us that our order, based as it was, was very largely responsible for the parties getting together. Obviously, any commission like ours wishes to do everything possible to promote unitization.

. . . As to editorial material, let me suggest that a great deal more attention be given to the conservation of oil and gas. Conservation means restriction on all imports; this is necessary to preserve market equilibrium, which is essential to conservation.

This also means depletion, as depletion is for a similar reason a great aid to conservation. Conservation may solve the problem of keeping America strong.

that is, by having at all times within continental United States an adequate supply of petroleum for all purposes. We have in America more oil underground than the great reserve in the Middle East. Conservation may find a method that much of this oil may some day be produced.

In fact, I think a vigorous and continuous editorial policy to promote conservation, and also to assist the regulatory bodies, would be very helpful.

Warwick M. Downing
Chairman
Colorado Oil and Gas
Conservation Commission.

Expanding Fuel Needs

"It would appear that the commercial air-transport industry's present 1 billion gallons per year requirement for high-octane fuels will expand until 1962. The requirement then will be for 1 billion 4 hundred million gallons.

"Coincident with this expansion a new requirement for jet fuel will begin its spiral and based on projected delivery of jet equipment, should create a requirement of 1 billion 4 hundred million gallons in 1962—equalling in 6 years the requirement which has been building from the day 52 years ago when the Wrights first flew at Kitty Hawk."

James H. Carmichael, president of Capital Airlines, in a speech at Atlantic City, N. J., before the National Petroleum Association.

Industry's Answer: Unity

"The extent to which we are willing to resolve our differences in the interest of all concerned may well determine whether new legislation would merely change or clarify producer regulation by the Federal Power Commission; whether it would exempt the producer from regulation through self-executing statutory provisions; or whether the regulation will be that which is most feared by the producer—total regulation, including some measure of regulation of oil production with which it is in many instances associated.

"Many believe it too late for the producer to escape total regulation. It need not be so if our recommendations are economically sound and have been prepared with the realization that each legislative failure to exempt the producer enmeshes the industry deeper and more assuredly in governmental control."

J. J. Hedrick, president of Natural Gas Pipeline Co. of America, Texas Illinois Natural Gas Pipeline Co., and the Independent Natural Gas Association of America, in a speech at the I.N.G.A.A. annual meeting.

Atom Will Help Oil

"The fears that atomic energy will replace or even rival petroleum as an energy source in the foreseeable future are groundless. Great as are their possibilities for some important uses, heavily shielded atomic reactors just do not lend themselves to nonmilitary moveable equipment such as automobiles, trucks, tractors, and airplanes. Because of atomic energy's potential use in research and in processing and finding oil and gas, we look upon it as a welcome helpmate of the oil industry."

Stanley Learned, chairman of the executive committee and assistant to the president of Phillips Petroleum Co., in a speech before the Florida Petroleum Marketers Association.

Bouquets for All Departments

Dear Sir:

So often, in reading through The Oil and Gas Journal, I come across letters in the They Say section of your magazine pointing out and correcting certain errors that have appeared in previous issues. This letter is not for that purpose; rather, it is my object to praise. I have been a subscriber to The Oil and Gas Journal for several years, and,

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Branches In All Principal Drilling Areas

having received the last issue of October 8, 1956, as usual, I began to read it quite thoroughly. I have just finished reading that issue, and may I take this opportunity to commend you and all the departments of your magazine on a most excellent issue. Without using any adjectives or superlatives, may I also say that it was most interesting and informative. It would seem to me that the material and information therein presented should be important and of great concern to the whole industry in this day of rising prices and costs of development.

J. Rosenbloom
Rolo Oil Co.
Shreveport, La.

Siren Songs and Real Wages

"In absolute terms, a million dollars of profit looks huge to people making a few dollars an hour.

"But you and I know all too well that even $100 million of profit may be inadequate to pay the carrying costs of our capital requirements for replacement and expansion. Have we intelligently and effectively explained why?

"The rosy forecasts and the intemperate demands of labor leaders are understandably motivated.

"Tragically enough, these siren songs sound all too attractive to the average worker whose heavy installment debts may be paid by cheaper dollars. But cheaper dollars won't replace the capital investment to maintain jobs unless insufficient cash from depreciation is supplemented by proportionately higher profits . . .

"No one believes more sincerely than I that rising REAL wages are essential ingredients of continuing prosperity. Let's keep them REAL by having the wisdom to understand and the courage to stand fast for the kind of wage trend that will help us remain a dynamic industry . . ."

Henderson Supplee, Jr., president, Atlantic Refining Co., before the National Petroleum Association, Atlantic City.

Oil Union's California Stand

"Out California way, the major oil companies (except one) might be succeeding in stirring up an interest in politics in some folks who are often too lazy to vote.

"The majors, except for Union Oil, are vigorously pushing for adoption of Proposition 4, an oil and gas control measure masquerading as a "conservation" bill, on November 6. These major oil firms have put out thousands of car stickers urging the people of California to vote for Proposition 4. They've put these stickers on company

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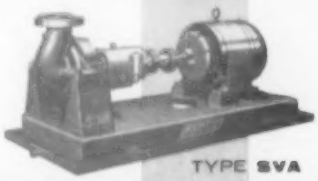

TYPE SVA

RATINGS	TYPE SVA	TYPE SVS	TYPE SVC	TYPE RVC
Capacity — in GPM	15 to 1300	15 to 1000	25 to 3200	50 to 600
Pressure — in PSIG	To 600	To 600	To 600	To 600
Head — in feet	To 600	To 600	To 600	To 900
Temperature — °F	To 300	To 300	To 850	To 850
Number of stages	One	One	One	Two

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PACIFIC'S skillful mechanical and hydraulic design.

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Top-quality materials of construction for the service conditions involved.

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Precision workmanship by PACIFIC'S skilled craftsmen.

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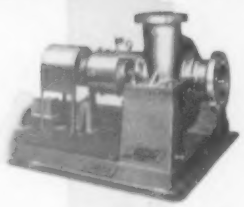
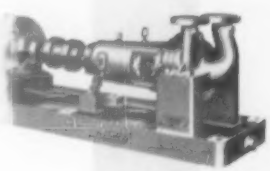
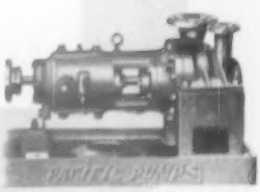
Write for Bulletins, describing and illustrating PACIFIC process pumps.



TYPE SVC



TYPE SVS



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"he's drilled over 60 miles so far...with just one set of U. S. Rainbow V-Belts," says "Red" Royal

"Red" is talking about "Catline" Dodson, a young contractor who has only one rig, so breakdowns to him are murder.

In the past 4½ years "Catline" Dodson (of Edmond, Okla.) has shifted his rig over 75 times, drilled a total of 320,000 feet so far—with the *same set* of U.S. Rainbow® V-Belts on a *compounded* mud pump drive. "It might take me up to 6 hours to replace a broken set of belts," he says, "and I figure my downtime at about $50 an hour. But U.S. Rainbow V-Belts have never failed me, not even in the near-zero temperatures. The set has so far drilled over twice the footage I'd estimated."

"Red" Royal knows many a toolpusher who will tell you Rainbow V-Belts are unbeatable for reliability. Each belt has the unique Equa-Tensil Cord Section that enables each cord to pull its full share of the load, for extra power. Your drilling dollars deliver *more* when you have "U.S." V-Belts, and other quality "U.S." oil-field products.

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Driller T. L. Dodson checking one set of U.S. Rainbow V-Belts.

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United States Rubber

trucks too—and therein lies their contribution to political action.

"Word comes to use that more than one truck driver, usually not too concerned about politics, has had his political ire aroused by being compelled to wheel a vehicle bearing oil industry campaign propaganda. What's he doing about it? Here are some of the tales we hear:

"First, if he's not registered to vote, he's registering. Second, he's putting a 'Vote No on Proposition 4' sticker on his private car. Third, he's getting his wife mad too—and she's calling the union office asking for more "vote no" stickers for the neighbors. Fourth, by clearly proving just how completely they are in politics, the oil companies are succeeding in bringing more working people to the polls on election day. And from all reports, more of these working people will be voting against Proposition 4 and for Stevenson and Kefauver than not."

Editorial in the Union News, Oil, Chemical, and Atomic Workers International Union newspaper.

Alaskan Oil Horizons

"In Alaska, where we hold rights on approximately one million net acres, we are continuing exploratory drilling on a large structure located by surface geology. Our third test now drilling has found numerous shows of oil, as in the second exploratory hole, but these are not considered commercial in relation to the relatively high costs of operation. The heavy rig now being used is capable of drilling horizons below those penetrated in the first two wells . . ."

Paul Endacott, president, Phillips Petroleum Co., in remarks to the New York Society of Security Analysts.

CALENDAR

OCTOBER

29-30 Independent Petroleum Association of America, twenty-seventh annual meeting, Statler-Hilton Hotel, Dallas.

29-31 Energy Resources Conference, sponsored by the Denver Chamber of Commerce, Denver.

29-Nov. 1 Society of Exploration Geophysicists, annual meeting, Roosevelt Hotel, New Orleans.

31-Nov. 2 Gulf Coast Association of Geological Societies, sixth annual convention Plaza Hotel, San Antonio.

NOVEMBER

1-2 Louisiana Polytechnic Institute, fifth annual instrumentation conference, Ruston, La.

7-8 Instrument Society of America, Philadelphia Section, symposium on proc-

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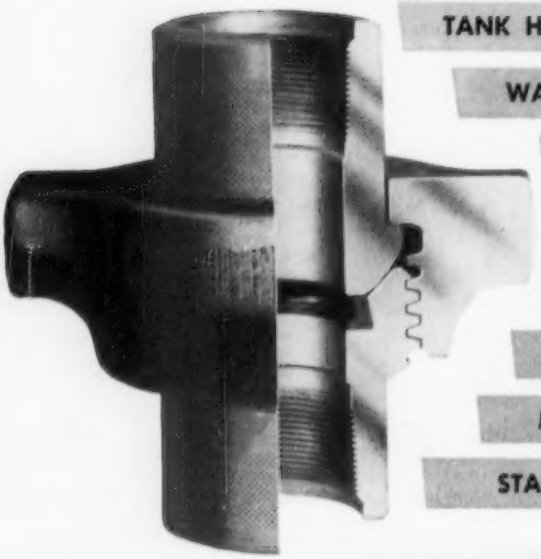

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ess data logging, Stratford Hotel, Philadelphia.

8 West Central Texas Oil and Gas Association, annual technical and membership meeting, Hotel Wooten, Abilene, Tex.

8-9 American Association of Oilwell Drilling Contractors, eleventh annual drilling safety clinic, Statler-Hilton Hotel, Dallas.

8-9 American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists, Pacific Coast Joint Regional Meeting, Ambassador Hotel, Los Angeles.

8-9 Society of Automotive Engineers, Inc., national fuel and lubricants meeting, Mayo Hotel, Tulsa.

12-15 American Petroleum Institute, thirty-sixth annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

13-14 University of California, National Association of Corrosion Engineers, short course on underground corrosion, Lafayette Hotel, Long Beach, Calif.

15-16 National Association of Corrosion Engineers, Western regional division conference, Lafayette Hotel, Long Beach, Calif.

19-20 American Institute of Mining, Metallurgical & Petroleum Engineers, North Texas Secondary Recovery Symposium, Municipal Auditorium, Wichita Falls.

25-27 Kansas Independent Oil and Gas Association, nineteenth annual meeting, Broadview Hotel, Wichita.

25-30 American Society of Mechanical Engineers, Statler Hotel, New York.

26-28 Conference on Solvent Extraction, sponsored by Oklahoma A.&M. College, Stillwater, Okla.

30 Natural Gasoline Association of America, Panhandle-Plains regional meeting, Herring Hotel, Amarillo, Tex.

DECEMBER

3-4 New Mexico Oil and Gas Association, annual meeting, Alvarado Hotel, Albuquerque.

6-8 Interstate Oil Compact Commission, annual meeting, Fontainebleau Hotel, Miami Beach, Fla.

9-12 American Institute of Chemical Engineers, annual meeting, Statler Hotel, Boston.

11-12 Water Quality Control for Subsurface Injection, conference sponsored by the University of Oklahoma, Norman, Okla.

1957

JANUARY

14-16 Pipe Line Contractors Association, ninth annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.

14-18 Society of Automotive Engineers, annual meeting, Sheraton-Cadillac and Statler hotels, Detroit.

17-18 Engineers Joint Council, Statler Hotel, New York.

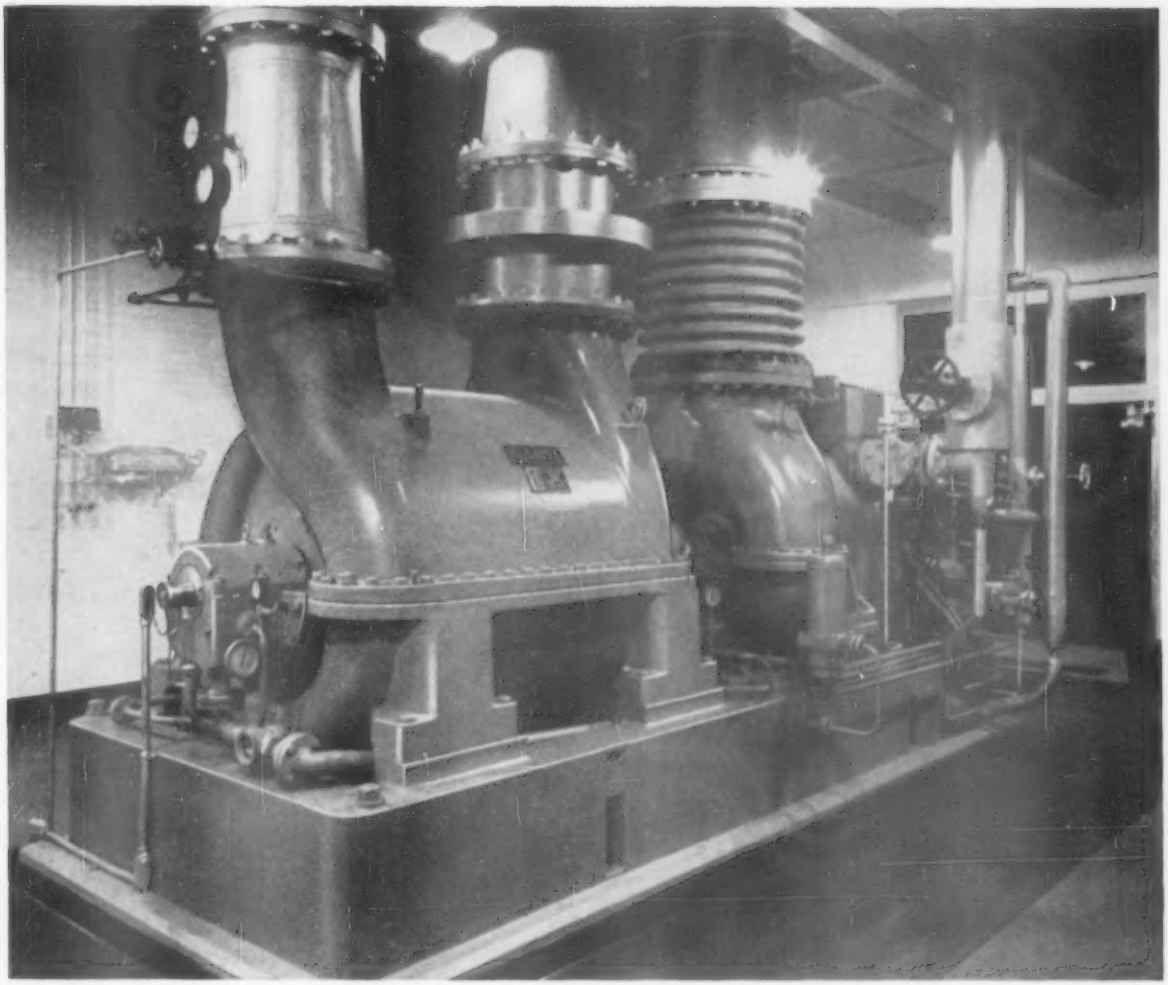
21-25 American Institute of Electrical Engineers, 1957 winter general meeting, Hotel Statler, New York City.

FEBRUARY

13-15 National Association of Corrosion Engineers, Tulsa section, eighth annual short course for pipeliners, Hotel Mayo, Tulsa.

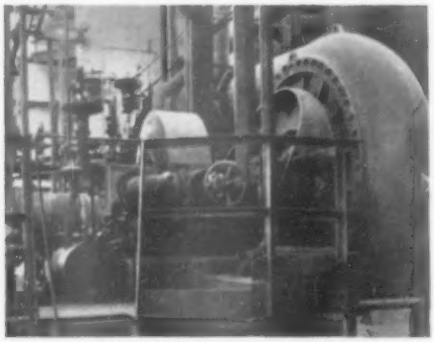
22 Natural Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

24-28 American Institute of Mining, Metallurgical and Petroleum Engineers, annual meeting, Hotels Roosevelt and Jung, New Orleans.



Tops for Refinery Service...

ELLIOTT TURBINE-DRIVEN CENTRIFUGAL COMPRESSORS



Another cat cracker gets the benefit of an Elliott turbine-driven centrifugal compressor. Single-stage compressor handles 36,050 inlet cfm at a discharge pressure of 4.0 psig; turbine develops 890 hp at 3600 rpm.

Years of non-stop service lie ahead of Elliott turbine-driven centrifugal compressors like the one shown above which was recently installed in a new cat cracker in the Southwest. The Elliott multistage compressor, handling 19,500 inlet cfm at 22.0 psig discharge pressure, and the Elliott steam turbine, rated 2035 hp at 5800 rpm, have been teamed together by Elliott engineers. Coordinated design, and construction, followed by a combined shop test, have made this a smoothly-operating unit that performs as well as it looks.

Get complete details about Elliott turbine-driven or motor-driven centrifugal compressors; ask your Elliott field engineer or write Elliott Company, Jeannette, Pa.

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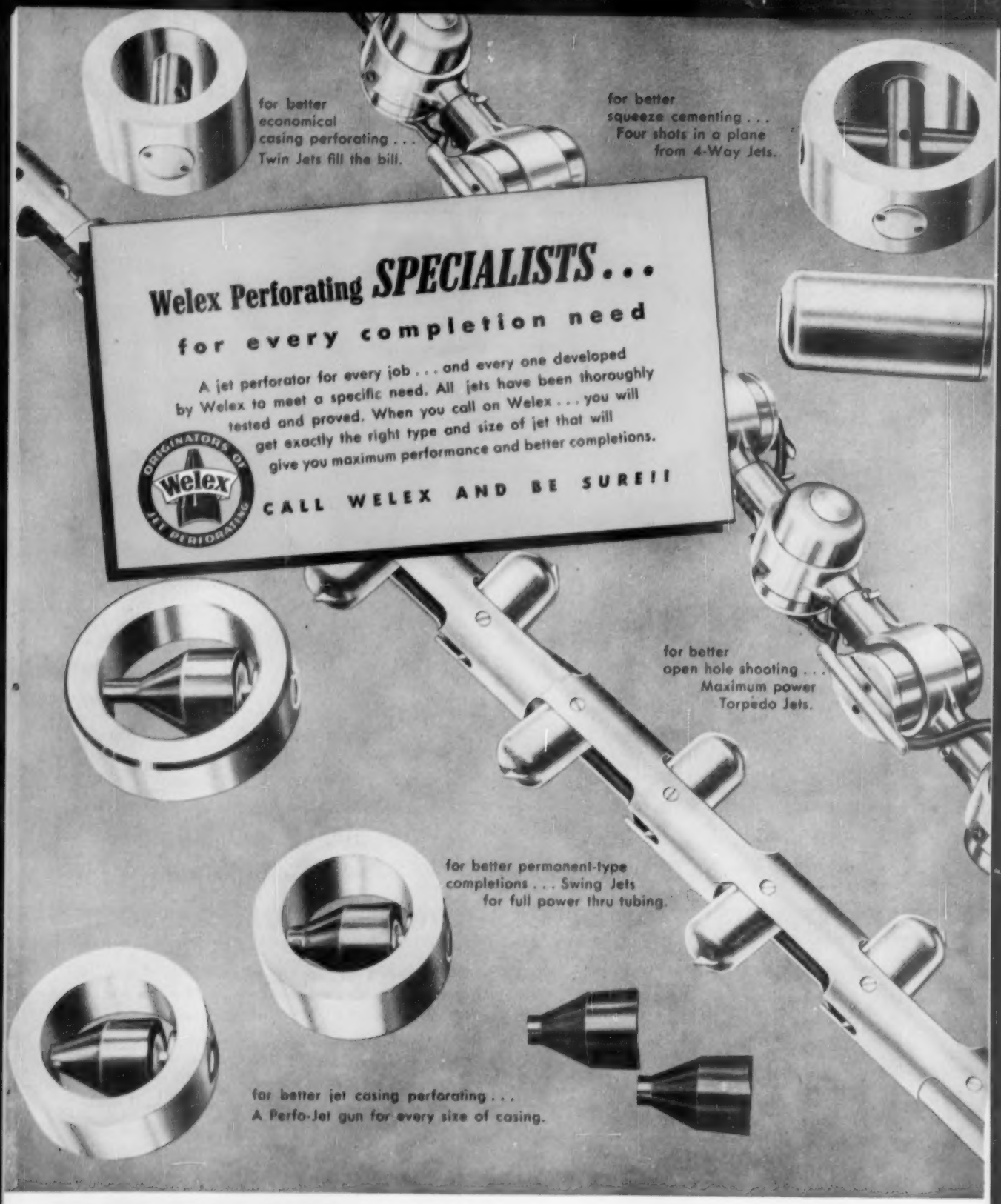
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The OIL AND GAS JOURNAL

TULSA, OKLAHOMA

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HARRY BECKER — European Representative

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JOURNALLY SPEAKING . . .

Cut for K5BPA

IF any one of our 37 regular readers is a radio ham he might be interested in communicating with Wallace J. Stroud, an engineer with Bel Oil Corp. at Elton, La.

Stroud, a reader of and sometime contributor to our favorite oil publication, is a ham, and he sent us his card embellished with an ancient picture of a gusher gushing over a wooden derrick. And he wrote:

"My problem is this. Being a typical, fairly, anyway, engineer with a small oil company, I just plain can't afford a fancy cut of some modern equipment. That shot of a gusher in the old Jennings field was all that the printer had in the junk box.

"Now, rather than take food away from my two turtles, three fish, two raccoons, horse, two dogs, three children, and wife, to buy one, could I prevail on you to loan me one suitable for this purpose? Something real purty.

"After all, I have been looking at the pictures in the Journal for 8 years, ever since I became eligible by becoming a greasy roustabout. Even read some of the stuff. Especially mine. Several times, in fact.

"These cards go out all over the world. When I'm lucky and the band is open and the rig doesn't break down and the high-power boys don't snow me under, that is. So you don't want to see this old antiquated equipment going out to impress people with the backwardness of the Great American Oil Industry, do you?

"Don't worry though. Even if you can't fix me up, I have to keep reading the Big Yellow Book. Every once in a while I learn something. Happens pretty often too. And I ain't too dumb to start with."

Well, we couldn't resist such a worthy cause (or such subtle flattery), so we dug in our own junk box and found him a used engraving of a modern drilling rig.

Now as for you hams: Stroud's call letters are K5BPA, and his card includes this additional cryptic information: XMTR: Viking Ranger; 65W INP; RCVR: 5X71; 135' wire; PSE QSL TNX, 73.

You take it from there.

Very Much for P.R.

IN the same mail we got another letter, also, in its own way, just about as cryptic. This fellow read the Journal's editorial on Oil Progress Week and the letter on public relations from Dorsey Hager, both in the October 15 issue. He wrote:

"I was reminded of the story of the man who, after his wife had to go to court and sue him for nonsupport of herself and children and then go back and have him put under a peace bond to keep him from beating her and the children up, complained that he could not understand why his wife's relatives and friends didn't like him.

"I guess you are wondering what I am trying to say so let's look at industrial relations a minute. It might be what the oil companies need to get them off dead center on public relations. Sure I know about the big wages that oil employes get and the other benefits but how do you think they got them and why do you think any employe will join a labor union? If they did not think that was the only way they had of getting a fair deal they sure would not join a union.

"I suppose you think that I am looking at only one side of the picture, but I assure you I am aware of both sides and I am very much for P.R. and oil progress for only as my employer progresses do I have a chance to progress."

You take it from there.

Symbolism at Sea

WE just read an article about ships' figureheads which said that these prow ornaments are coming into fashion again for today's modern merchantmen.

"A new tanker of one of America's leading oil companies will carry the heroic-sized form of a sea goddess."

Hmmm. Now if domestic producers were to design figureheads for importers' tankers we might get some dillies, say like a cornucopia pouring out endless quantities of oil, or a sheik in a solid-gold Cadillac, or a satyr with thumb to nose.

You take it from there.

—Henry D. Ralph.

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Here's the nut of the imports problem

LAST week's Washington hearings on oil imports did much to clarify thinking, sort out the issues, and lay the groundwork for some next step.

It seems fairly well established that crude imports are now so high as to threaten the ability of the domestic industry to play its expected future role in national defense.

And the over-all level of imports recommended by the Office of Defense Mobilization—the 1954 ratio to domestic production—is generally viewed as reasonably fair and realistic.

THESE TWO PRINCIPLES may now be accepted as the basis of policy, at least until conditions change materially. But serious objections have been raised to ODM's formula for applying restraint on imports.

Producers say that special treatment given for reasons of national defense should be made within the over-all limitation, not outside of it. For example, if nearby and easily defendable foreign oil is to have a preference it should be at the expense of remote sources, not at the expense of U. S. producers.

Importers say that the ODM proposal discriminates among them in a variety of ways. Importers who have held the line would be penalized more than those who greatly boosted their shipments in recent months; those who have new foreign purchase contracts and nearly completed refineries designed for foreign crude would be hit severely; and how to deal with future new importers is left unanswered.

Finally there is the matter of enforcement, assuming that a satisfactory formula could be devised for applying the accepted principles. Here the issue has been widely split between the extremes of "voluntary compliance" and "government regulation."

Practically everybody shies away from government regulation, and will embrace it only as a last resort. But most producers argue that voluntary compliance has been insufficient in the past and will be in the future, and many importers agree with this.

SO HERE'S THE PROBLEM as narrowed down by the ODM hearings: How to get a nondiscriminatory formula and a method of applying it that will be somewhat stronger than a pious request but short of detailed government regulation of the whole industry, foreign and domestic.

There is great leeway between these two extremes. We already have the first step in control—a government-set target for imports. To get the minimum next step a wide diversity of possible means should be explored. Novel variants of tariffs or quotas, or a combination of them, might be devised to fit the problem.

Unless the industry's ingenuity can offer a suitable alternative, the Government may go much too far toward total regulation.

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Current and significant in . . .

The Industry This Week

Offshore

• **Texas' claims to submerged lands** in the gulf out to 3 leagues have been dealt blow by state Supreme Court. The tribunal refused to rehear previous ruling against state ownership of 572 acres on coast. Key issue: Do state-owned submerged lands begin at ordinary high tide of English Common Law or highest tide of Spanish-Mexican law. Court favored use of common law. Now Texas fears it will have trouble sustaining use of Spanish-Mexican law to uphold its 3-league argument with federal Government over its offshore boundary.

Offshore operations still are stalled 2 weeks after U.S.-Louisiana agreement to permit new drilling in disputed zone. Anderson-Prichard, first to get permit, is drilling below 2,000 ft. in its East Cameron test. Three others—Phillips, Superior and Shell—have permits for wells. But other operators are still neck deep in paper work. State Mineral Board has cleared 15 leases for drilling, expects to clear 55 soon, and has 200 still to process. All operators probably could resume work within a month.

Exploration

• **Geophysical activity is still dropping,** with many factors working against the technique. What is needed: A new way for finding strat traps with success and accuracy that it finds structural reservoirs. P. 76.

Sinclair's strike in Eastern Venezuela looks twice as good as first reports. A second producing zone shows as much promise as the first. P. 83.

Shell and Humble have an offshort strike in 67 ft. of water 40 miles off Louisiana. It's on an expensive lease previously hurt by two dry holes. P. 71.

Processing

• **Straight gas-turbine engines are preferred** by automobile industry if buying public forces change from conventional piston engine. But best bet, if change comes, is the free-piston engine. Refiners, pondering future fuel picture, are caught in middle. P. 72.

Turkish American Oil is going ahead with plans for 15,000-bbl. refinery near Istanbul, despite threat of opposition from four major operators. P. 81.

Fuel injection for the family car is closer to reality as Chevrolet offers it in 1957 models as optional equipment. Refiners predict its acceptance will be slow and its effect on fuel specs will not be known for some time. P. 66.

Pipelines

• **Coal's battle with gas** has been taken to District of Columbia Court of Appeals. Coal interests contend use of gas as boiler fuel violates conservation principles. Gas, they say, is too valuable a fuel for such inferior use. FPC ruled otherwise in allowing Northern Natural Gas Co. to sell gas for the Black Dog generating station. Crux of fight: Gas would displace 633,000 tons of coal annually at the station, meaning a $3½ million loss in coal business.

Second products pipeline from Salt Lake City to Spokane to serve expanding Northwest markets is being considered. Principals are Indiana Standard, Phillips, Sinclair, and Continental. P. 78.

Industry

• **Quick tax writeoffs** on plant expansions for alkylate, oil-country tubular goods, and steel plate apparently will get no consideration until late winter. Sen. Harry F. Byrd has ordered sweeping investigation of defense plant tax amortization benefits. He asked Mobilization Director Flemming to keep the lid on new writeoffs until the probe is completed. Byrd claims peacetime tax incentives may create unfair competition, over-expansion, and damage to smaller business.

DESPITE SLOW, RAIN-SOAKED start, jam-packed grounds on third day meant a record attendance.

Past, Future Blend at Odessa Oil Show

ODESSA, Tex.—The 1956 Permian Basin Oil Show, this year's single biggest observance of Oil Progress Week, waited out unprecedented heavy rains here early in the week and then poured on the steam to snap all previous attendance marks.

A record 153,402 persons, about 12,500 more than in 1954, swarmed through the show's gates during its 4-day run October 18-21.

Torrential rains totaling 5½ in. in 4 days, more than half of Odessa's previous rainfall for the year, turned the 66-acre grounds into a bog, hampered exhibitors, and dampened spectators. Show attendance, hit hard the first 2 days, otherwise might have reached almost 200,000.

Huge equipment display . . . Permian basin oil men and general-public visitors were treated at the attraction to the biggest display of oil equipment ever amassed in the area in one place.

An official 508 exhibiting companies showed thousands of individual equipment items. The number of exhibitors also broke a record—easily exceeding the 1954 edition's total of 392 and more than doubling the 1952 show's 228 exhibitors.

Equipment exhibits, befitting an area with few refineries but roughly 450 active rigs and more than 50,000 producing wells, fell primarily in the drilling and production category.

And like a mirror, they reflected changes in drilling-production techniques now taking place in the area.

A profusion of exhibits devoted to automatic lease production and custody transfer equipment indicate that manufacturers expect a great future for this new production technique.

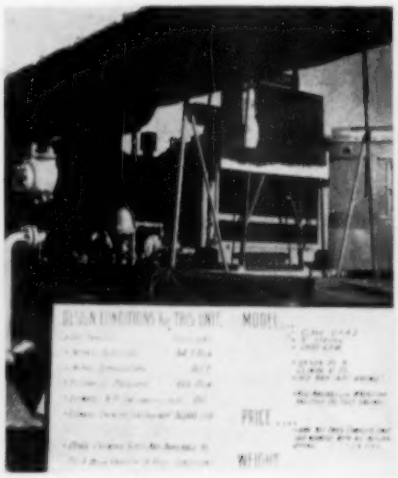
Several exhibitors showed completed layouts in this field. Others displayed automatic crude-volume metering vessels, sampling devices, various types of switches, panels, and other components of automatic systems.

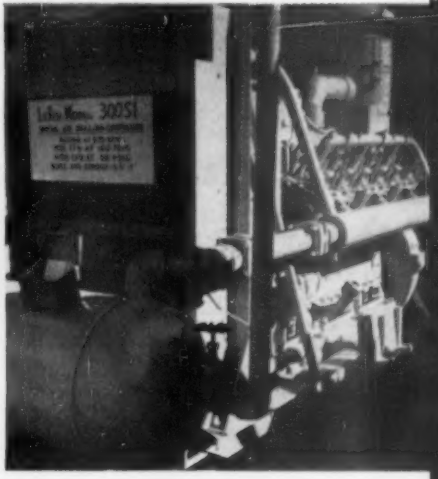
Another trend underlined by the equipment displays is the turn to more powerful formation-fracturing equipment.

Dowell Incorporated, for instance, exhibited an experimental unit soon to be tested near Gainesville, Tex. It consists of separate truck-mounted generator and pump units. A 2,000-hp. Rolls-Royce Merlin aircraft engine on the generator truck is coupled to a 1,100-kw. gas-turbine type generator.

Air Compressors

From left below are the Joy AP2, rated at 1,050 C.F.M. at 125 psig.; the Clark CFA2, a 151-hp. package rated at 752,000 cu. ft. daily; and the Le Roi 300S1, rated at 1,160 C.F.M. at 100 psig.





Completion Units

Shop-fresh, heavy-duty units from left above and below right are Halliburton transportation, mixing, and pumping equipment; Western Co.'s Model RB-80 pumper; Dowell Incorporated's experimental electric generator-motor pump drive for fracturing; and an acidizing-fracturing unit of recently merged B-J Service, Inc., and Chemical Process Co.

Many new down-hole tools, designed specifically for use in the relatively new permanent-completion type well, were exhibited for the first time. New hydraulic, tubing, and rod-type pumps with new high-pumping capacities, rigs designed solely for slim-hole drilling, and new types of power units, perforating, and fracturing equipment were displayed.

Boom-town popular . . . Next to the most modern equipment the industry can offer was some of the oldest it ever used—incorporated in a carefully planned haphazard-looking version of a typical early American oil boom town.

Center of the exhibit was an ancient wooden-derrick, steam-engine-driven cable-tool rig, and a reconstructed boom town boasting old-time barber and print shops, saloon, sheriff's office and hoosegow, and "Bijou" theater where the Oil Industry Information Committee showed its newest oil movies.

Other items contributed by oil companies for the project included antiquated rotaries (one a horse-operated version), pumping units, and rolling stock.

The big show was launched October 18 with a 3-mile parade down Grant Street, Odessa's main thoroughfare.

It was the sixth in a series beginning in 1940. The show at that time was billed as the "Little International Oil Exposition." It was suspended after a second showing in 1941 for the duration of the war and revived under its present title in 1950 as a biennial attraction.

Old Equipment

Progress was emphasized by, from left below, ancient pulling rig; cable-tool rig which still made brisk hole for visitors; and a horse-drawn ancestor of cementing trucks.

Hearing airs problems, Flemming promises . . .

Imports Issue to Get Quick Decision

WASHINGTON. — The oil industry will know before the end of the year whether planned imports of Middle East crude in 1957 will raise a threat to national security.

A quick decision was promised last week by Mobilization Director Arthur S. Flemming as ODM General Counsel Charles H. Kendall opened a 3-day hearing on the domestic producers' plea for government controls.

Flemming said he would reach a conclusion on the basis of reports of 1957 import programs to be filed with the ODM by November 8.

"I will not wait for analysis of actual performance during the first quarter of 1957," he declared.

If there is reason to believe the import situation threatens national security, "and if I conclude further that adequate steps are not being taken to remove the threat, I must, under the law, so certify to the President," Flemming added.

A score of producers testified at the hearing, making a strong bid for official controls.

They indicted the voluntary control program set up last year as a failure. And they charged that Flemming ignored the intent of Congress that all imports into all areas be kept within the Cabinet Fuels Committee formula.

But importers, particularly companies just getting into that field, strongly resisted government control. Competitive conditions on the East Coast and lack of supply on the West Coast can be met only by imports, they said.

Some companies held there is no need for any controls. Others agreed the domestic producers must be protected. But all said firmly that any controls should be voluntary.

Newcomers a problem . . . The hearing brought out that while most long-time importers have followed the cabinet committee recommendations, the problems of fitting new importers into the picture is a complicating factor.

Flemming's exclusion from the import base of Canadian and Venezuelan crude, residual fuel oil, and imports into the West Coast was challenged at the start of the hearing by Sen. Frank Carlson of Kansas and Rep. Frank Ikard of Texas.

The two are members of the congressional committees which passed on the national defense clause (Section 7) of the Trade Agreements Law. Both asserted that Congress never intended that any imports should be exempted in applying the cabinet committee formula.

"The intent was to limit imports from all sources into all areas of the United States," Carlson declared.

Producer spokesmen conceded that imports from Western Hemisphere sources involve less risk than those from the Middle and Far East.

They agreed that Canadian and Venezuelan oil should be given preferential treatment. But they argued that increased imports of that oil should be offset by cuts in imports from the high-risk sources.

The idea of a single standard for imports also was advanced in arguing against the exclusion of residual oil and West Coast imports.

Every exclusion has had the practical effect of increasing the original standard for total imports, producers declared.

How producers hit . . . How increasing imports have affected domestic producers in various areas was outlined by a parade of witnesses.

On the West Coast, the Oil Producers Agency of California said, new rigs erected were off 16 per cent in 1956, compared with 1953, active drilling wells were off 26 per cent, and completions were down an estimated 8 per cent.

"The reason for the lack of price response to a shortage of supply is found in imports, the laid-down cost of which is estimated variously at between 15 and 35 cents per barrel less than the cost of comparable California crudes," the agency declared.

At refineries . . . In Southwest Texas, shipments from Corpus Christi to East Coast refineries dropped from 206,575 bbl. of crude daily in 1948 to 110,000 bbl. last year, it was testified by John W. Crutchfield, consulting engineer representing the Corpus Christi Crude Oil Study Committee.

In the same period, the East Coast refineries increased their runs of foreign crude from 325,700 to 633,000 bbl. daily, he said.

"The conclusion is that imports of low-cost foreign oil have actually supplanted Southwest Texas oil on the East Coast and that this depressed market in the face of rapidly increasing finding and production costs is having serious adverse effects on the ability of the Southwest Texas producers to maintain desired levels of reserve producing capacity and drilling exploration," Crutchfield asserted.

In exploration . . . The over-abundance of foreign oil has brought about a 14 per cent decrease in the number of active exploration crews since 1953, it was reported by J. P. Coleman of Wichita Falls, Tex.

When imports exceed the 1954 standard by 300,000 bbl. daily, the total income of the domestic industry is reduced by $850,000 a day, Coleman said.

The result is that 40 to 50 wells are not drilled each week because the restricted domestic market denies the industry the necessary funds and incentive.

In Oklahoma, imports are responsible for an increase in marginal wells plugged from 832 in 1954 to a rate of more than 1,200 this year, Mack M. Braly of the Oklahoma Independent Petroleum Association, said.

There were 110 fewer exploratory wells drilled last year than in 1954. And Oklahoma, which at one time supplied 13 per cent of the nation's crude now produces only about 8 per cent.

At the pipelines . . . West Texas producers are unable to get pipeline connections because of imports, it was charged by P. W. Pitzer, Jr., president of the West Central Texas Oil and Gas Association.

More than 130,000 bbl. of crude monthly, from 308 wells owned by 34 producers, has to be hauled by truck at costs ranging from 11 to 37 cents per barrel, he said.

Other Texas producers also complained of inability to get pipeline connections.

The effects of excessive imports were summed up by A. E. Herrmann, president of TIPRO.

Exploration has been retarded to the point where the industry has failed to keep reserves in proper relation to future oil requirements, he said. The conservation structure is jeopardized, and the amount of risk capital available is seriously restricted.

In drilling . . . Analysis of drilling activity shows that one foot of hole is drilled for each $30 in oil sales, Jack H. Abernathy, president of the American Association of Oil Well Drilling Contractors, told the hearing.

On that basis, the 1956 imports of about 1,480,000 bbl. daily, equivalent to domestic sales of about $4,100,000, represents 136,000 ft. of hole daily, he said.

"It is calculated that 12,400 wells annually are not being completed within the continental U. S. which would be drilled if all income available from domestic markets were expended in domestic exploration and development," Abernathy stated.

What importers say . . . Importing interests contended that intense competition on the East Coast forced them to use imported oil.

In general, they agreed that imports should be kept at a level that would not stifle domestic production. But the established importers protested against being cut back to make room for newcomers.

S. W. Stose of the Atlantic Refining Co., which is taking Middle East oil in payment for Eastern Hemisphere marketing subsidiaries which it sold, protested it is "illogical and unfair" to ask a reduction in imports by companies which have complied with the cabinet committee formula.

A reduction in the oil received under that sale would impose a severe hardship on his company, he added.

Any imports above the recommended level will injure the domestic industry, John W. Swearingen, executive vice president of Standard Oil Co. (Ind)., told Kendall. But any restriction plan should be voluntary, he said, and should make provision for new importers.

Swearingen suggested that imports be divided among individual refiners on the basis of their proportion of refinery runs.

Any plan which does not provide for such sharing will penalize some refiners by denying them a choice between foreign and domestic crude, he said.

Newcomers' views . . . As a "newcomer in foreign oil," Standard Oil Co. (Ohio) has a big stake in any decision on import policy, R. S. Stewart, vice president, pointed out.

A policy which discriminated against new importers would make the company non-competitive, even in an area where only small amounts of products made from foreign crude are sold, he said.

"Most of the products come from domestic supplies," Stewart explained. "Nevertheless, we are competing with at least seven companies which are major importers and, while the products of their crude imports may not enter this area, their dollars do."

It is just as important to insure maintenance of a reasonable level of imports as to prevent an excess, Standard Oil Co. (N. J.) said in a brief filed with the ODM.

The level of imports set by Flemming for 1957 is "reasonable" in the absence of positive and definite evidence to the contrary," but imports are not the sole cause of all the problems of the domestic industry, nor is restriction the sole solution to all those problems, the brief declared.

Imports rise seen . . . The Texas Co. also submitted a statement in which it warned that an increasing need for foreign oil is inevitable in the years ahead.

"It is important that the entire structure of the industry be permitted to adjust gradually toward increasing proportionate use of foreign supplies, including the further development of American controlled foreign reserves," it declared.

A cutback in imports would force the industry in the reverse direction, delaying this adjustment and causing an unnecessary drain on our remaining domestic reserves, it warned.

Flemming's recommendation that 1957 imports be kept one per cent below the average in the first half of this year was protested by Sun Oil Co. as discriminating and unfair to refiners, such as Sun who are only now turning to foreign oil.

Under that recommendation, R. G. Dunlop, Sun president, said, the company would be limited to 26,000 bbl. daily. That would be nearly 24,000 bbl. less than the average 50,000 bbl. per day Sun already has contracted to import next year.

Sun would fare worse than any of the other ten East Coast refiners now importing crude. Five competitors would be able to import as much as they scheduled in their September reports. Two others would be penalized only slightly and another two less than 20 per cent.

Dunlop suggested that if national security requires regulation of imports, the most practical, easiest and fairest way would be through "the traditional tariff route."

The many problems of such a course, however, make it impractical at this time, so a better way might be through relating imports to refinery runs, he said.

Dope Gang Eliminated on Pipeline Job

PAYNE, Ohio.—The dope gang was practically eliminated from a pipeline project here last week when a long pipeline for the first time was wrapped with polyethylene tape.

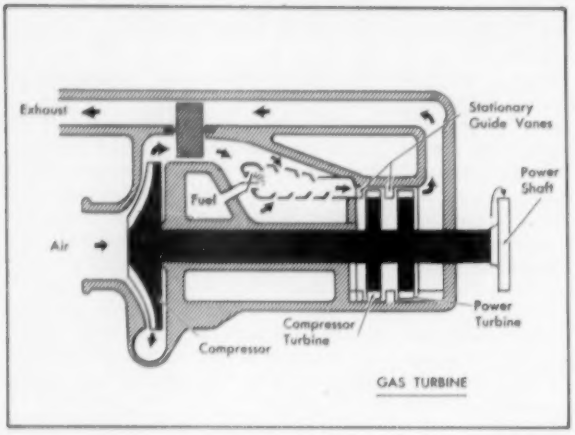
The taping was completed on 122 miles of 22-in. lateral from Payne to Bridgman, Mich., for American Louisiana Pipe Line Co. The firm is connecting its new 30-in. main line with the Michigan Wisconsin Pipe Line Co. system.

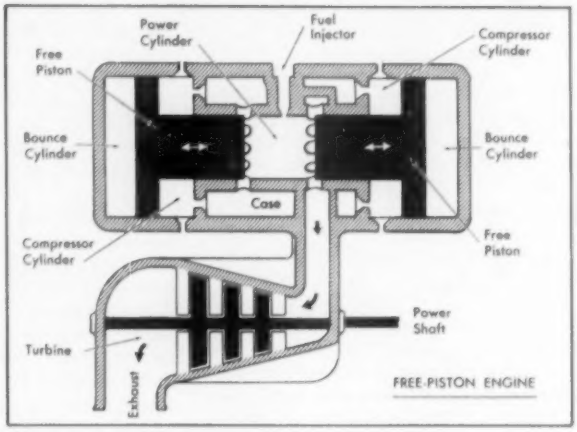
Each of the two contractors on the project—H. C. Price Co. and Houston Contracting Co.—had a spread on the job applying Polyken plastic tape.

The tape was used instead of the customary hot coating to protect pipe against corrosion. This simplified operations by eliminating priming and enamel coating operations. Cleaning, cradling into the ditch, and backfilling were carried on close to the taping machines.

Over the plastic tape the machine wound an outer wrap of Johns-Manville glass-reinforced coal-tar-impregnated asbestos felt to protect the tape against damage during backfilling.

What Next in Automotive Fuels?





The Gas Turbine . . .

. . . has been getting a lot of attention from Detroit's scientists . . .

BUT

The Free Piston . . .

. . . concept feeding a power turbine may take the play away.

Meanwhile, Detroit would like to continue boosting the spark-ignition engine with fuel injection, supercharging, and high compression ratios, all of which could bring on an evolution to the diesel cycle engine.

Detroit doesn't know which way to jump, hence the car makers must hump to keep up development of all these prospects. Refiners, pondering their future fuel picture, must look to Detroit —which in turn will be guided by public acceptance.

George Weber
Refining Editor

NEW YORK.—If the buying public forces the automobile industry to make a change from the conventional piston engine, it would like to adopt the straight gas turbine.

But if you're laying money on the line, bet in favor of the free-piston engine.

The big question today about the gas-turbine auto is not only when, but whether, it ever will appear on the nation's highways. In fact, as P. Frank Martinuzzi, a gas-turbine expert, puts it, it is not possible now to forecast on a rational basis its eventual use in passenger cars.

There are too many factors involved, the Stevens Institute of Technology professor says, that do not bear directly on engineering and economics.

Martinuzzi spoke during a symposium conducted here last week by the American Institute of Chemical Engineers. Thoughts on future engine trends were sandwiched between ideas on jet-aircraft requirements and the outlook for the gas turbine in marine and stationary power units.

Action may be forced . . . The principal auto manufacturers would favor staying with the piston engine. It still can stand further improving.

But in a competitive field they must be prepared to turn to other engine designs if the public shows a preference for them.

The small company with little to lose and possibly much to gain is Martinuzzi's candidate for introducing a new engine type. If such an innovation catches on with the public, the majors would be forced to follow suit.

A satisfactory gas-turbine automobile is possible within the next 6 or 8 years, Martinuzzi believes. It should prove competitive with the improved piston engine in mileage. It would be lighter and simpler. It may be lower in cost, assuming powdered metal casting of turbine blades becomes possible on a mass basis.

The big "ifs" . . . The oil industry cannot rely on these rational expectations in laying plans to switch from high-octane gasoline to wide-cut jet fuels.

Actual adoption of such a new engine type will depend on several factors. They are intangible to say the least but nevertheless must be considered. They are:

. . . The public's whim. Fads are a factor. Radical new styling, possible with the gas turbine could make or break it depending on acceptance of buyers, prominently from the distaff side.

. . . The dealers' attitude. When a gas-turbine engine needs repairs, it is likely to go back to the factory. The dealer does not look on this possibility with favor.

. . . The economic climate. Any recession, however slight, is likely to inject conservatism into car buying. Fuel economy, while not presently practiced, is possible with the conventional piston engine.

. . . The early safety record. A few bad smashups with early gas-turbine cars might give the whole conception a bad name, whether deserved or not.

. . . Operational trouble. A record of breakdown whether driver-induced or caused by necessity to operate on an unsatisfactory interim fuel could kill the gas turbine's popularity before it got started.

Detroit in the middle . . . To meet these unknown eventualities, the major automotive companies must hedge by continuing their gas-turbine programs. The development bill stands at about $75 million today, Martinuzzi said.

At the same time, Detroit must have other irons in the fire. Prominent among these is the free-piston engine. In Martinuzzi's opinion, the free-piston engine looks like a good bet to come sooner than the straight gas turbine and to stay longer in the automotive field. This type of engine is very economical on fuel and has a wide appetite. Dealers, not to be ignored in Detroit, favor it over the gas turbine.

Meanwhile, the piston engine is going to see some changes. Although Martinuzzi thinks compression ratios, power output and gasoline octanes are all too high today, they are going higher. The buying public wants it that way, so long as good times persist.

This evolution of the piston engine poses still another possibility in the future. As compression ratios rise to the 12 or 14 to 1 range, fuel injection will certainly come into the picture. So will supercharging. This will create serious preignition problems. It may develop that this highly bred engine may operate better as a diesel than as a spark-ignited engine and a supercharged diesel may emerge as its immediate successor. Then out the window will go octanes, and a complete turn-about in fuel qualities will be in order. This could happen much sooner than 1975.

Martinuzzi is not predicting any of these eventualities without plenty of qualifications. At the present, however, he believes that the free-piston engine may have the edge. At any rate, he is certain that octanes and particularly preignition are going to be a much greater problem than they are now, before they are succeeded by others. For the present, oil company forecasters can take their choice. But they had better consider women buyers, warns Martinuzzi.

Gas turbine prospects . . . A few prototypes of the automotive gas turbine have been built. But little practical know-how has been gained on their performance in long term service.

It is unlikely that enough of these cars will have been produced by 1970 to have any material effect on fuel requirements, reported C. F. Holloway, technical advisor on aviation service to British Petroleum Co. Ltd.

If and when these automotive gas-turbine fuels do come into the picture, they will require very low carbon-forming tendencies and low sulfur contents, he said. A suitable fuel probably will be a distillate with a wide boiling range and an end point of about 650° F.

For marine and industrial use, the picture is different, Holloway said. Good experience has been chalked up on stationary units burning natural gas. Many more will probably be built, but they will be restricted to areas where low cost gas is available. Gas turbines of this type will not noticeably affect the world fuel situation in the future.

The same holds true for units fueled by distillates. The gas turbine shows a low thermal efficiency compared with the diesel, and high distillate-fuel costs will restrict this combination. It is likely that many industrial gas turbines based on distillate fuels will be built, however, for peak load and standby purposes.

Resid appetite the key . . . Before the gas turbine can find acceptance on any large scale in marine and stationary power installations, it must demonstrate an ability to burn all currently available residual fuel.

It hasn't yet reached this stage. Some are performing well with low ash or favorable ash residuals. Treating some fuels helps, but treating costs must be kept low if the gas turbine is to remain competitive with the diesel in these fields.

In the aviation field, the fuel requirements of the near future are fairly well defined. But Holloway foresees the supersonic jet transport first appearing on the scene by about 1965. It will be 1970 before any pattern on fuel for these commercial aircraft appears.

A very special fuel will then be needed. High heating value, low fuel weight and thermal stability will be critically restrictive. It is suggested, said Holloway, that the combination of requirements cannot be met by a petroleum product. But the oil industry, together with associated chemical industries will have to work out the answer.

G. W. Ferguson of The Texas Co.'s research laboratories reviewed jet fuel requirements and added a note on the fuel needs of aircraft to operate above the speed of Mach 2. Boiling losses at very high altitude cannot be controlled by pressuring or insulating tanks because of weight restrictions. Hence, a change is in order in the distillation curve of these future fuels. A 300-600° F. fuel has been proposed.

These planes will be volume-limited rather than weight-limited. This calls for a higher B.t.u. content. Thermal stability will be a paramount requirement due to the ram temperatures imposed at Mach 2 and faster speeds. In this respect, an improvement on the current Erdco type tests is needed. JP-6, now under consideration, must pass the standardized Erdco test with a maximum of 10 in. of mercury in 5 hours.

Petroleum lubes for jets? . . . The lubrication requirements of future supersonic aircraft are not yet defined precisely, said W. W. Gleason of Esso Research & Engineering Co. But they will impose bearing temperatures of 600-700° F. and lubricant temperatures of 350-450° F.

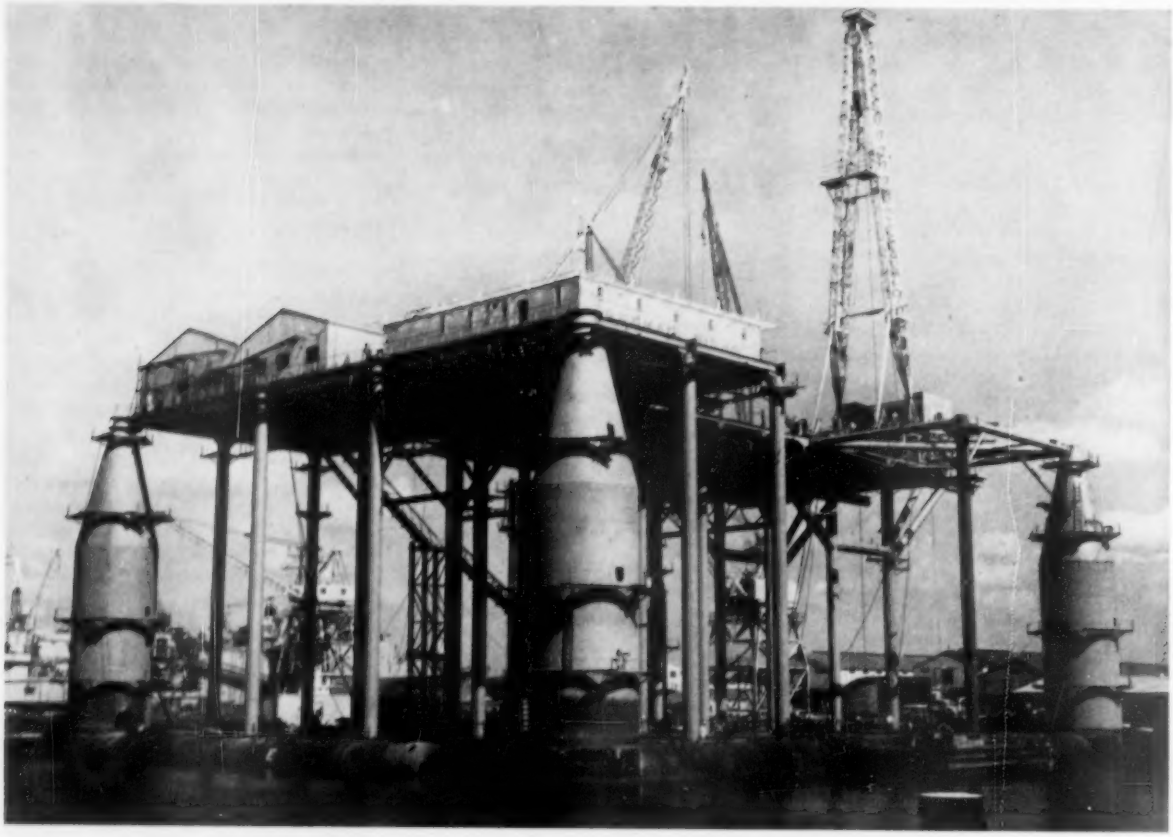
This will call for lower deposit-forming and corrosion tendencies, better oxidation stability and lower volatility. These properties look difficult, if not impossible, to achieve together with the low-temperature fluidity requirements. Hence it appears that the military may relax its low-temperature specifications.

This would open the door to many potential base stocks, both synthetic and petroleum in nature. In fact, mineral-based lubricants may come back into the picture. Synthetic stocks now used exclusively in new jet aircraft, both commercial and military, degrade rather badly at higher temperatures. The Mil-L-7808 oil shows coking test deposits of only 30 milligrams at 600° F. as compared with 200 milligrams for high quality mineral oil. But at 700° F. the synthetic shows 2,100 milligrams vs. 400 for mineral stocks.

As a result of these high temperature difficulties, some engine designers are now considering the "waste feed" lubrication systems. These call for once-through passage of lubricating oil through the bearings followed either by rejection overboard or return to the fuel system for burning. In this limited duration service, mineral oils would show an advantage over synthetics because they are lower in cost and more widely available.

For the automotive gas turbine, Gleason believes that the lubrication problem may be no more severe than that posed by the earlier jet aircraft. This would permit mineral-based oils to remain in the picture. Some earlier thinking on this coming problem rejected the possibility that petroleum-based lubricants could be considered.

The free-piston engine imposes generally lighter restrictions on lubrication. But the top ring is very likely to be the limiting factor. It operates under very high temperatures and will require close attention from a lubrication standpoint.



World's tallest floating structure, biggest submarine.

Kermac Rig Put to Work at Good Time

PASCAGOULA, Miss.—Kerr-McGee Oil Industries, Inc., will put its huge new submersible drilling barge to work in the Gulf of Mexico next week. The unusual piece of equipment was commissioned here last week at the Ingalls Shipbuilding Corp. yards.

Kermac couldn't have picked a better time to make its Rig 46 available for work. It came just as drilling is being resumed after a temporary agreement between Louisiana and the federal Government over operations in the disputed offshore "twilight zone."

The greater portion of the "twilight zone" involves water depths for which Rig 46 was specifically designed. Kermac engineers designed the rig to operate in a maximum water depth of 70 ft. They figured equipment so built would be able to drill on a majority of the oil-lease blocks offshore and thus would have a better chance of always keeping busy.

The outlook . . . Other important aspects of Kermac Rig 46 were stressed by speakers at the commissioning.

Monroe B. Lanier, president of Ingalls Shipbuilding, described it as "the largest such rig yet built" and added: "When not submerged, this rig is the tallest floating structure in the world." He also said when the vessel is submerged it is the world's largest submarine.

Lanier explained to Kermac officials, oil industry leaders, and the trade press at the ceremony that the rig design involved new application of all principals of naval architecture. He declared it obtained increased stability and strength by reducing to a minimum the surface exposed to waves and wind.

Lanier also predicted that it will not be long before drawing boards will disclose plans for offshore rigs to drill in more than twice the 70-ft. limits of Rig 46.

Sen. Robert S. Kerr, board chairman of Kermac, said the people who designed and built the rig and those who will operate it are contributing significantly to the nation's offshore reserves. He predicted these reserves will be important in the future because "in the next 16 years more oil and gas will be consumed in this country than during the past 100 years."

The rig . . . Several unusual features are contained in the rig *(The Oil and Gas Journal, October 8, page 118).*

It has a flat hull composed of 14-ft. diameter steel tubes constructed in a grid pattern. The working floor is 100 ft. above the hull and attached to it by 26 supporting steel columns. The drilling rig itself is set on a movable double base cantilevered 55 ft. from the side. This enables operators to drill six wells along side the barge without moving. A new type mast also has been placed on the platform which can help build production platforms for completed wells without calling in a crane boat.

A trail-blazer . . . Kerr-McGee has been a pioneer in offshore drilling.

The company in 1947 drilled the first discovery well out of sight of land in unprotected waters in the gulf. It pioneered the use of the submersible barge in offshore drilling in 1950.

Asphalt Ridge Sold

Sohio will explore Utah's rich oil sands deposits

VERNAL, Utah. — Standard Oil Co. of Ohio has acquired title to extensive oil sands deposits known as Asphalt Ridge in Unitah County near here. It will undertake exploration and engineering studies which may lead to commercial development of the deposits.

Sohio Petroleum Co., a wholly owned subsidiary of Ohio Standard, actually acquired the titles. It took over interests in the patented lands and placer claims owned by Orem Development Co., Knickerbocker Investing Corp., the W. M. Barnes Co., and Ridge Development Corp.

Sohio will undertake exploration of the properties and make engineering studies. If sufficient economically recoverable reserves of oil are indicated, the sands may be mined and a separation plant built probably near Vernal. Sohio will serve as operator of any separator plant built with Knickerbocker and Barnes retaining a profits interest.

Asphalt Ridge is about 15 miles long. Core drilling indicates its oil-saturated sands in some places are over 100 ft. thick. Oil content in these spots averages 1 bbl. per cubic yard of sand.

Asphalt Ridge is believed the largest bed of oil-saturated sands in the United States. The Athabasca tar sands located in northern Alberta are larger and considerably better known. Pilot plants to separate and process the oil currently are in operation there.

Water Shortage Averted

BEAUMONT.—Light rainfall in East Texas has given several refineries a 2-week reprieve from a threatened cutback in their water supplies.

The Lower Neches Valley Authority had scheduled a 56 per cent reduction in water distributed to industrial users, effective last week. As a result of rainfall averaging about 1 in. in the Neches River watershed, the board decided to postpone its rationing order at least 2 weeks.

Curtailment of water deliveries would hit about 15 big plants, including five refineries, in the Beaumont-Port Arthur area. Most of the companies were expected to continue operations by substituting salt water for fresh water where necessary. Refiners said use of salt water would greatly increase maintenance costs but would cause no immediate cutback in production.

watching WASHINGTON

. . . with Bertram F. Linz

Congressional torpedoes for tankers? . . .

A LOT of ground will have to be covered before the administration's tanker-building idea can become a reality.

Shipyard capacity, steel availability, port facilities, and competitive considerations are all questions that must be carefully considered before a final decision on whether to go ahead with a tanker-building program is reached. But back of those is the biggest question of all—will Congress go for the billion-dollar deal?

President Eisenhower's call for a 50-ship tanker fleet isn't something that will be met overnight. It's a long-range program. So it has no relation to the present Suez Canal stalemate. But it does relate to something pointed out over a year ago by U. S. Maritime Administration officials —block obsolescence.

The T-2 tankers built during the war will reach the end of their normal life within a few years. That doesn't mean they can't be operated longer. But they will be competing with larger, more modern vessels such as are now being built.

Government officials have long been aware of this. That is one reason for the several efforts that have been made in Congress and the departments to spur the building of new tankers. Congress has been for these plans in principle, but less enthusiastic about providing money. It will want to take a long look at any new program.

Drought ambushing fuel supply . . .

PRACTICALLY unnoticed except by oil companies and others sitting on top of it, a condition which could result in a fuel shortage in the northern Middle West this winter is building up.

Drought is steadily lowering the water level in the Mississippi River. Oil transporters and government officials watching the situation say if it continues it may soon create an emergency in an area from Chicago north.

About 600,000 tons of oil are hauled up the Mississippi monthly by barge. Transporters already have had to lighten loads in order to get through the locks at Alton, Ill. If the river continues to drop they will have to carry lighter loads at points much farther south.

Only heavy rains over the northern part of the Mississippi Valley will keep the river from falling to a new low level by the end of the year, it is said. A further drop of about 5 in. could bring most of the river traffic to a halt. And it is a question whether pipelines, trucks, and railroads could handle the volume of oil that now moves by water.

Covetous eye for technicians . . .

THE short supply of engineers which is already worrying industry may become even shorter in a matter of months.

Facing a serious lack of technical personnel, the Government is showing indications of going into competition with industry for the services of both experienced and newly-trained scientists and technicians.

As a first step in the campaign, the administration may ask Congress next year to hike the government salary scale to a level equal with industry. Salaries paid by the Government today are considerably below the industry level. Also, the Government is slower to adjust pay rates to living costs and demand for labor.

Agency heads complain that they are losing their best people to outside employers at salaries the Government can't meet. And for the same reason, they are unable to recruit replacements.

There is a large number of federal offices using technical workers. The military services and the Bureau of Standards are said to have been hard hit by industry's drive for technical talent.

Fuel Injection Bows In

Chevrolet makes new engine design available first time to mass market; but its slow acceptance is predicted

FUEL injection for the family car became a reality last week. Chevrolet, largest motor division of General Motors Corp., introduced its 1957 models and announced injection fueling is optional equipment.

This made fuel injection—long a plaything of engine researchers—available to the mass market for the first time.

Chevrolet action caused mild surprise in automotive and oil circles. The accepted timetable was use of injection in sports cars only this year with possible introduction in some general models starting next year. In the past the new fueling system has been confined to a few racing cars.

What's the idea . . . Chevrolet's big move is seen primarily as a sales promotion stunt rather than reflecting any basic changes in engine design at this time.

Use of the optional fueling equipment may come slowly. Probably very few of the new engines will be immediately available. Reliable reports are that fuel-injection engines will be installed first in the Corvette, the sports car of the Chevrolet line. If results are satisfactory and there is a demand, the engines can be obtained later for other Chevrolet models.

Chevrolet has made no announcement on cost of the fuel-injection engines. Indications are, however, the engines when available will cost from $500 to $600 more than the conventional carburetor types.

Refining reaction . . . Refiners received the Chevrolet move with mixed reactions. They are concerned chiefly with its significance to motor-fuel specifications.

Most refiners agree that use of fuel injection will be adopted slowly. This is true even if it proves more satisfactory and more generally adaptable than most of them now expect.

They report some time will elapse before effect of fuel injection on motor-fuel specifications will be known. In the meanwhile, the new engines will have to be adapted to the use of present grades of motor fuels.

One authority in the field of motor fuel research predicts fuel injection will not alter the present emphasis on high-octane ratings. He reports the tests he is familiar with point to improvement in antiknock performance with fuel injection under controlled operating conditions. But he feels some or all of the advantage will be lost in actual installation. This will arise from the mechanical tolerances that will be necessary.

Research men outside the automotive industry also question another claim for fuel injection: That it will reduce carbon deposits because of better carburetion. This claim is based on less deposition from the fuels and also from the motor oils.

Increasing research attention already is being given to motor oil properties. Special studies of carbon deposition are being made to determine its direct relation to antiknock performance in present carburetor-type automobile engines. Whether there is an inherent advantage in fuel injection in reducing this problem is a debatable question, according to those familiar with the subject.

Vapor lock . . . Natural-gasoline manufacturers also have a stake in success of fuel injection.

They have been particularly interested in research on the subject for several years. Most natural-gasoline men feel its application to automotive engines will permit use of more volatile fuels now limited by their tendency to vapor lock. They reason that fuel injection would open larger markets for natural gasoline for use in motor-fuel blends.

Experiments have shown that higher vapor fuels do give satisfactory results with certain designs of fuel injection. But whether these designs will meet all needs of automotive engines is another question. The impact on marketing of the low boiling point fractions of gasoline, as a consequence, is yet to be determined.

Advantages . . . Chevrolet is claiming many advantages for its fuel injection type engines. Among them are:

. . . Increased power.
. . . Instant accelerator response.
. . . Faster cold starts.
. . . Engine warmup smoother.
. . . Carburetor icing eliminated (there is no carburetor).
. . . Better fuel economy.

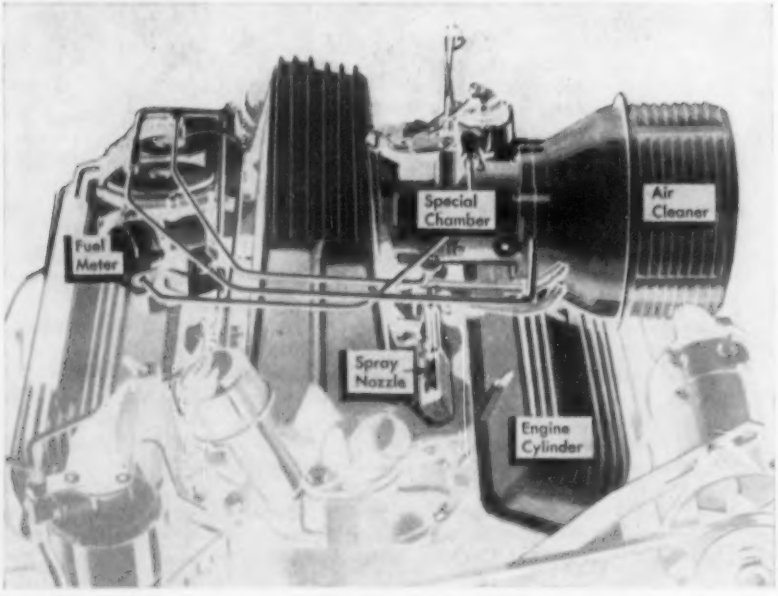
Chevrolet gives this explanation of how its new engine works.

Nozzles—one for each cylinder—atomize the gasoline and aim it directly at the intake ports in a pressurized spray. Amount of fuel delivered depends on the air flow. It in turn is controlled by the accelerator.

Outside air, after entering the air cleaner, flows through a special chamber which divides into separate tubes, one for each cylinder (see drawing). As the air flow approaches the cylinder, it mixes with fuel from the nozzle. This carries the atomized fuel directly into the cylinder in a precisely controlled air-fuel ratio.

A fuel meter delivers fuel to each nozzle by a pressurized pump from the fuel reservoir through a regulating system which meters it to the cylinders. Once the air-fuel mixture enters the

Chevrolet's New Look in Engines



cylinder, normal combustion takes place.

Increased power from fuel injection is illustrated in the 1957 Corvette regular model. It has 245 hp. with dual four-barrel carburetors. This can be increased to 270 hp. with high lift cam usually installed for racing. The compression ratio is 9.5 to 1. With fuel injection the efficiency is increased, and the horsepower jumps to 283.

Note of warning . . . A rule of thumb in the automobile and oil industries holds that anything new in engines has to be foolproof in operation.

One car maker observed: "The modern car has to be operated without any difficulties by teenagers and their grandparents." With this in mind, many feel that fuel injection at best must undergo a long period of experimentation in operation before it is generally adopted.

Automotive trade circles hear a report in this connection that another large manufacturer plans to use its first fuel injection designs in trucks. This maker believes skilled truck drivers will help iron out the "bugs" before any application in the family car is attempted.

Pipeline Is Revived

Suez crisis gives new life to Gulf-East Coast carrier

WASHINGTON. — The question of an emergency oil supply for the East Coast has been revived as a result of the Suez Canal situation.

New proposals for a 500,000-bbl. daily products pipeline from the Gulf Coast to the Atlantic seaboard have been submitted to the Office of Defense Mobilization by the American Pipe Line Corp.

The idea of building an East Coast line was dropped early this year. It was ruled then that developments in the industry would make it possible to meet most of the East Coast requirement from sources other than the Gulf Coast.

American offered to build an all-new line. Texas Eastern Transmission Corp. proposed a line based on the conversion of the Little Inch line from gas to oil. Both called for government backing of loans. Mobilization Director Arthur S. Flemming said he doubted "whether it would be appropriate for the Government to provide any incentive for the construction."

There is no indication that the ODM will reopen the issue at this time. A high government official said there was nothing in the Suez Canal situation to make emergency construction necessary.

Processing BRIEFS

The Texas Co. is expanding its Port Arthur, Tex., refinery with a new catalytic cracking unit and a new vacuum pipe still.

The fluid cat cracker will have a rated throughput capacity of 90,000 bbl. daily and is one of the largest of its kind in the world. It will cover three acres and its tallest tower will be 165 ft. high. The 80,000-bbl. per day capacity vacuum pipe still will replace existing units with a daily charge capacity of 60,000 bbl. The result will be a 20,000-bbl. daily increase in crude capacity of the refinery.

Chemical Construction Corp., recently acquired by Electric Bond & Share Co. from American Cyanamid Co., will expand its activities to include the petrochemical as well as the chemical field.

Engineering, design and construction services are being expanded. The company has designed and built plants for synthetic ammonia, urea, formaldehyde, methanol, sulfuric and nitric acids, acetylene from natural gas, and phosphate and nitrogen fertilizers. New projects include two ammonia separation plants and a urea plant in Japan.

Fire broke out in a sweetening unit at Magnolia Petroleum Co.'s Beaumont refinery last week, seriously burning two employes.

The fire, accompanied by a loud explosion, apparently started from a welding machine working in a nearby unit. The blaze was confined principally to two small drums in the sweetener, where a gasoline line broke.

Tidewater Oil Co. has started charging crude to its 130,000-bbl. daily refinery at Delaware City. Streams from the single crude unit will run to storage until the fluid catalytic cracking, catalytic reforming, and other facilities are brought on stream later this year or early in 1957. Some marketable fuel oil will be sold, however.

Tidewater lists ten other processing units which will comprise the giant plant. They include, fluid catalytic cracking, catalytic reforming, reformate extraction, fluid coking, gas recovery, catalytic polymerization, catalytic hydrodesulfurization, sulfur recovery, alkylation and hydrogen synthesis to augument the production of byproduct hydrogen from the catalytic reformer.

General Petroleum Corp. will invest an additional $6 to $8 million in the new Ferndale, Wash., refinery to raise its crude capacity from 35,000 to 48,000 bbl. per day. The 3-year-old refinery is now adding a $7 million, 9,000-bbl. per day Sovaformer. This unit, included in the expansion program just announced, will upgrade heavy naphtha by catalytic reforming when it is completed next year.

Shell Oil Co. has completed its fifth film in the "This Is Oil" series. The newest film covers the marketing phase of the industry. It will be followed by a film on oil research.

The Texas Co. research center at Beacon, N. Y., has celebrated its 25th anniversary. The center was set up in 1931 with 125 employes in an old woolen mill. The installations now occupy a 187-acre site with over 1,100 employes in the 91 chemical laboratories and 66 engine-test stands. The company also has other centers at Port Arthur, Port Neches, and Bellair, Tex., and at Montebello, Calif.

Also for Refiners . . .

Refiners are looking to Detroit for a hint of the future fuels picture, but the auto-buying will determine which way Detroit will jump. The free-piston engine now looks as if it may take the play away from the straight gas turbine (P. 62) . . . Standard of Ohio will take a close look at developing oil sands following the purchase of oil-sand lands in Utah (P. 65) . . . Fuel injection is now available for the family car, but no mass changes in engine design are expected yet (P. 66) . . . A styrene plant is planned at the synthetic-rubber complex now going up near Odessa, Tex. (P. 69) . . . Du Pont's October survey shows the weighted average of premium gasoline has climbed to 96.8 research octane while regular has inched up to 89.5 (P. 80) . . . Turkish American Oil plans to break ground shortly after the first of the year on Turkey's first major refinery (P. 81).

PLUS THESE TECHNICAL FEATURES: An outline for the selection of materials to be used in catalytic reforming (P. 103) . . . How automatic meters blend lube oil faster (P. 115).

"Dangerous" Sand Sought

With new tools and more experience, Tidewater plans to tackle 13,000-psi. formation that scared it off in 1954

CROWLEY, La.—Successful completion of the world's deepest well has given South Louisiana operators new confidence in tapping high-pressure sands which they once shunned.

Modern advances in drilling and production equipment plus recent experience in deep holes may lead to oil and gas which until recently were out of reach.

Exemplifying the new confidence in deep, high-pressure sands is a new South Louisiana venture by Tidewater Oil Co. and associates. They are deliberately seeking a 14,500-ft. sand where extremely high bottom-hole pressures forced the plugging of a well just 2 years ago.

Tidewater's new test is the 1 H. Thibodeaux, in 83-8s-2e, Acadia Parish. It is in Church Point field, about 2 miles south of the town of the same name and 20 miles northeast of Crowley.

The well is 1,500 ft. southeast of Tidewater's 1 Daigle, drilled 2 years ago. The earliest test hit a 14,500-ft. gas and distillate sand with a bottom-hole pressure estimated at more than 13,000 psi.

Too much pressure . . . Because equipment then available was not considered adequate for such pressure, the well was plugged back and completed below 12,000 ft. as a gas producer.

Now Tidewater hopes to tap the same high-pressure zone, known as the Daigle sand. In the earlier well this zone was about 50 ft. thick.

In the new test, spudded last week, Tidewater plans to use at least two equipment innovations which recently were tested in the deepest well ever drilled. They are:

. . . P-110 pipe with a minimum yield rating of 110,000 psi. will be used in two strings of tubing.

This new pipe, which will be provided by National Tube Division of United States Steel Corp., is similar to that used in a 5-in. liner in the record-holding Richardson & Bass 1L Humble-L. L. & E.-State Lease 2414 *(The Oil and Gas Journal, September 3, page 117)*. Tidewater engineers and consultants helped test and evaluate the new high-pressure pipe.

. . . The Hydril triple-seal joint, first used commercially in the record holder, will be applied to 4-in. and 7-in. casing. Tidewater also helped develop this joint.

As insurance for containing high pressures, the joint butts at three points. Two 14° tapers make contact as the joint nears makeup. The shoulder between two thread-steps seals at complete makeup.

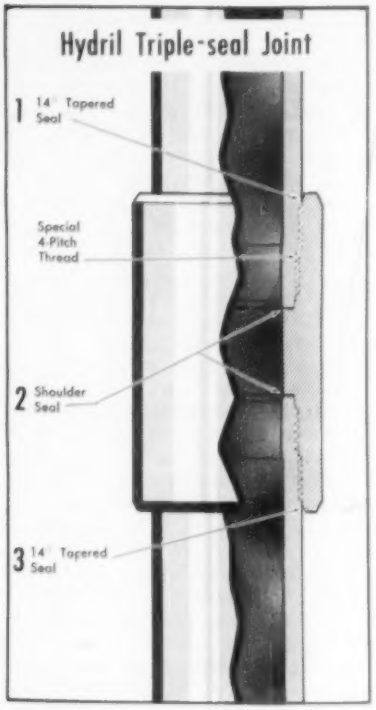
To prevent overtorquing, the shoulder on the coupling itself would seal if the joint were further made up *(The Oil and Gas Journal, September 3, page 118)*.

A christmas tree rated at 15,000 psi. working pressure will be installed if the well is successfully completed as a gasser. The tree was developed by Cameron Iron Works, Inc.

The cost . . . Drilling high-pressure wells, though not as dangerous as it was a couple of years ago, is still expensive. Participants in the test have budgeted $756,000 for the well.

Among the companies associated with Tidewater in the venture are Gulf Oil Corp., Amerada Petroleum Corp., and Petroleum Reserves, Inc. The operator has about 2,500 acres leased in the area.

About $320,000 is expected to be spent in the casing program alone. Plans call for setting 5,000 ft. of 13⅜-in. surface casing, 13,000 ft. of 9⅝-in. protection casing, 14,500 ft. of P-110 7-in., a similar amount of P-110 4-in., and a relief string of 2-in. tubing.



Texas Steps Up Allowables

AUSTIN.—Texas crude-oil production allowables will be increased in November for the first time since July.

The Texas Railroad Commission kept pressure on crude buyers by approving a 15-day producing schedule. All but three of the 12 buyers present sought a producing rate of 14 days or less.

The daily allowable for November was set at 3,314,390 bbl. This is 34,693 bbl. daily over the initial figure for October and 94,155 bbl. daily over the allowable in effect October 6.

Humble Oil & Refining Co., The Texas Co., and Sun Oil Co. were the three companies asking the higher rate. Seven others wanted 14 producing days. Shell Oil Co. favored a 13-day schedule.

Phillips Petroleum Co. nominated only 12. Phillips, which this month cut its crude takes 25 per cent of August runs from all wells to which it is connected, said it would have to continue to prorate at about this rate in November.

Take not ratable . . . Curtis Condra, Stanolind Oil & Gas Co. representative, told the commission that Phillips' proration in Texas is creating situations in many fields where take of oil is not ratable.

Stanolind, he said, is a producer in 19 fields affected by Phillips' cutback. In seven of these fields in West Texas, Stanolind is losing production while other producers connected to other buyers are producing their normal full allowables, he claimed.

TEXAS NOVEMBER ALLOWABLE

District—	Nov.	Increase over Oct. 6
1—Southwest	77,963	1,445
2—Gulf Coast	153,640	4,917
3—Gulf Coast	466,111	13,341
4—Southwest	242,356	6,542
5—East Central	43,901	945
6—Outside E. Texas field	132,139	3,980
6—East Texas field	205,105	5,936
7-B—N. Central Texas	179,150	7,527
7-C—W. Central Texas	204,020	6,740
8—West Texas	1,187,800	32,183
9—North Texas	297,572	5,438
10—Panhandle	124,633	5,161
Total	3,314,390	94,155

Drake to Get Top A.P.I. Award

J. FRANK DRAKE, former president and later board chairman of Gulf Oil Corp., will receive the American Petroleum Institute's 1956 Gold Medal for Distinguished Achievement.

The medal is regarded as one of the nation's top industrial citations.

The presentation will be made November 14 during the annual A.P.I. meeting in Chicago. Drake will receive the medal from Jake L. Hamon, chairman of the A.P.I. board of directors. It recognizes an outstanding American who has contributed substantially to the arts and sciences of petroleum or to humanity through petroleum.

Reasons for honoring Drake will be disclosed at the time of the presentation. Drake, a resident of Pittsburgh, retired in April 1955. He was then chairman of Gulf's executive committee. He was chairman of the board for 5 years and president 17 years. He still is a member of the board and of the finance committee.

Drake joined Gulf in 1919 as assistant to the president. In 1923 he became president of Standard Steel Car Co., also a Mellon company. He became board chairman of the Pullman companies in 1930 when they merged with Standard Steel. He returned to Gulf as president in 1931, became chairman of the board in 1948 and chairman of the executive committee in 1953.

He is a native of New England and a graduate of Dartmouth. He has been a member of the board of A.P.I., served with Petroleum Industry War Council and National Petroleum Council and was board chairman of the National Industrial Conference Board from 1945 to 1947.

Previous recipients include Wallace E. Pratt, Otto D. Donnell, Lt. Gen. Ernest O. Thompson, Walter C. Teagle, J. Howard Pew, Dr. Charles F. Kettering and Henry Ford.

J. FRANK DRAKE
. . . A.P.I. Gold Medal winner

Odessa Getting Styrene Plant

ODESSA, Tex.—Construction of a large new styrene plant will be kicked off here about the first of January to complete the final link in a huge synthetic-rubber complex now building.

The plant will be erected by Odessa Styrene Co., a newly formed firm owned 75 per cent by El Paso Natural Gas Products Co. and 25 per cent by United Carbon Co. It will cost around $5,000,000 and at capacity operation will turn out 35,000,000 lb. of styrene per year.

The styrene plant will adjoin a $20,000,000 butadiene plant owned by Odessa Butadiene Co., a joint venture of El Paso, United Carbon, and Odessa Natural Gasoline Co., and a $12,000,000 copolymer plant owned by General Tire & Rubber Co.

The copolymer plant, taking styrene and butadiene from the neighboring facilities, will produce up to 50,000 tons of synthetic rubber yearly.

Odessa Styrene has let contract for construction of the styrene unit to Fish Engineering Corp., Houston. Process design is by Universal Oil Products. The plant is scheduled for completion by January 1, 1958.

The General Tire copolymer plant will consume about 25,000,000 lb. annually of the new styrene unit's capacity. United Carbon Co. will take the remaining 10,000,000 lb.

Complex shaping up . . . Meanwhile, construction of the butadiene and copolymer units of the complex is going ahead rapidly. Foundation work is nearing completion, and some of the quench and scrubber towers had been installed last week.

Both these plants expect to be in production by about the middle of 1957. Reports are that styrene raw material will be brought in from the Gulf Coast until the local styrene facility is completed about 6 months later.

The newest outlay swells cost of the complex to almost $40,000,000.

Industry BRIEFS

Louisiana has temporarily reduced its oil-production allowable as a result of the recent hurricane which shut down wells in several coastal areas.

The November allowable of 734,888 bbl. daily is 14,394 bbl. below the October figure. Conservation Commissioner John B. Hussey said the margin may be reduced as allowables are assigned for wells resuming production.

Tentative plans were revealed last week for construction of an offshore drilling barge designed to operate in 120-ft. water. Chester Holley, a New Orleans marine engineer, said a local group of business and professionl men plans to organize Phoenix Exploration & Drilling Co. and invite bids for construction of the vessel early next year.

Majestic Contractors, Ltd., last week completed a natural-gas gathering system for Imperial Oil, Ltd., in the Redwater and Simmons areas of Alberta. The system consists of 60 miles of 4 to 16-in. pipe. Majestic also is building a 37-mile, 12-in. gas line for Imperial from Waterdown to North Toronto.

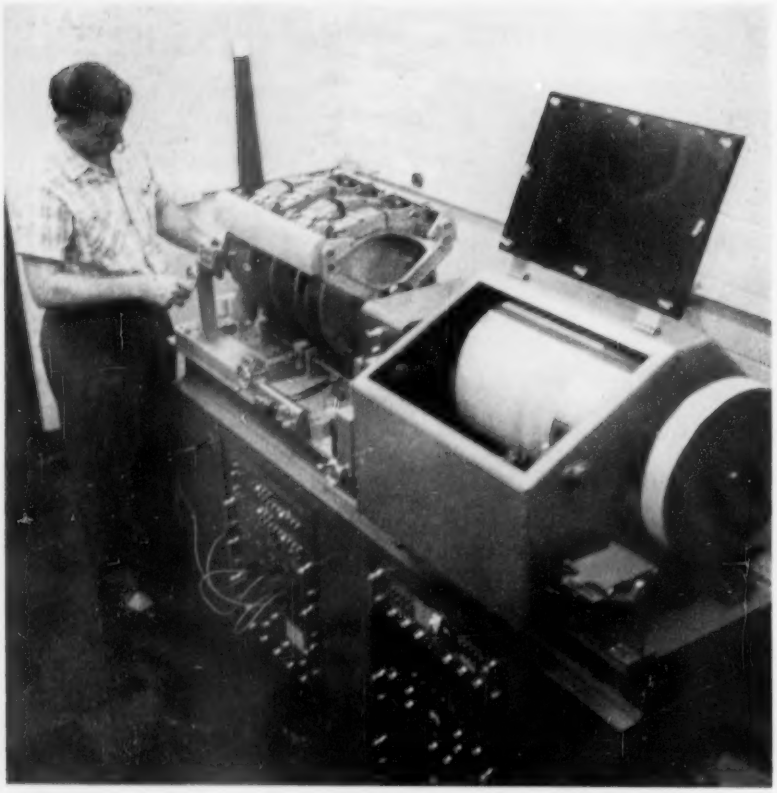
Saskatchewan crude production in July set a new record for the third consecutive month with a daily average of 52,237 bbl. The June figure was 51,040 bbl. daily and the July figure for last year was 34,275 bbl. daily.

Total production in July of this year was 1,619,364 bbl. with a gross value to producers of $2,686,923. This placed the year's cumulative production at 9,864,604 bbl., worth $15,707,396 to producers.

The International Association of Machinists and Pacific Lodge 1422 of the I.A.M. settled their suit against Proposition 4 out of court with the stipulation that the I.A.M. endorsement be removed from literature supporting the measure.

The I.A.M. had charged in their $5,000,000 suit against the Citizens Conservation Committee for Proposition 4 that the proponents were distributing campaign material in favor of the controversial Oil and Gas Conservation Act which illegally listed the I.A.M. as having endorsed the measure.

Great Basins Petroleum Co., Denver, has completed purchase of Brown Well Service of West Texas with the payment of $1,012,500. Total purchase price of the firm was $1,125,000 cash and 300,000 shares of Great Basins common stock.



Playback turns out corrected cross-sections from . . .

New Magnetic Recorder

TULSA.—Carter Oil Co. says it has developed new seismic - magnetic data processing equipment which costs no more than standard instruments but is far superior.

The company is moving to supply the new equipment to some 60 crews at work for affiliates in the Standard Oil Co. (N. J.) group around the world. It has decided to convert completely from standard amplification and photographic recording to the magnetic system, which is considered a major advance in handling of seismic data.

After 9 months' experience with the newly developed equipment, a Carter official said: "We will be able to obtain far superior seismic records and improve their presentation without any increased cost."

The development also will be felt outside the Jersey group. It could step up the industry's timetable for switching to magnetic recording. For Carter believes it has erased the big drawback to the new method: the high cost.

Its system, licensed to Electro-Technical Labs, Inc., Houston, is but one of several on the market. The hot competitive battle for leadership in the field is still going on. All of the magnetic systems, both of tape and disk design, have one goal: To produce a better seismic record that will help eliminate more of the guesswork from the search for oil traps.

When the first units came out Carter was displeased with them on two counts. It didn't like the quality or the high costs which added $1,000 to $1,500 a month to the contract price for a seismic crew. So 4 years ago the company started a project to develop its own magnetic system in the Tulsa laboratories. The result is the new recorder-playback for which it claims:

. . . **High quality**—pulse-width modulation improves signal-to-noise ratio, records more reflected subsurface energy and less external interference.

. . . **Relatively low cost**—$25,000 for complete field recording set including facsimile monitor, or no more than present standard equipment. The central office playback to reproduce the tape record with different filter settings—it's capable of almost 4,000—costs $40,000. That's less than half the price of comparable models which Carter says range from $90,000 to $120,000.

. . . **Simplicity**—only one amplifier.

. . . **Light weight**—the 350-lb. recording set breaks down into 35-lb. components for carrying to shot locations not accessible by truck.

By the end of the year Carter expects to have half its crews equipped with magnetic tape. In another year 75 per cent will be converted, and the changeover will be complete as soon as present equipment can be retired.

Electro-Tech, just now getting into full production, reports it has received orders for 34 units and has delivered around a dozen. Seismograph Service Corp., Tulsa, is licensed to make them for its own use.

Scientific acceptance . . . The change in recording, storing, and presenting seismic data is being made quietly but rapidly.

It is being hailed as the most important event since the inception of the reflection seismograph.

Of the 700 seismic crews at work in the world, some 175 use magnetic equipment of one type or another. Many contractors and operators converted on the basis of its technical superiority, even though there was strong doubt that it was economical *(The Oil and Gas Journal, April 16, page 118)*. Only the high cost kept others from changing overnight.

But improvements in technique and equipment, such as the Carter development, indicate the economic barriers may tumble. In the course of 5 years, magnetic recording has run the gamut from a laboratory device too costly to pay its own way to a practical tool which has both immediate and long-range benefits in the search for oil.

Aid to geologists . . . Seismic records obtained by equipment still being used by most companies are limited by predetermined instrument settings. Once the shot has been touched off there is no changing the seismogram.

The magnetic system, with broadband recording, alters this situation. Virtually all reflected energy is recorded on tape or disk. The record can be reproduced over and over again.

It can be played back with various filter settings introducing a single variable at a time to give the geologist the best possible record to interpret.

The data is further refined by making corrections in the playback to offset effects of varying conditions near the surface and different distances from geophone to shotpoint. The geologist then has a readable cross-section which permits him to concentrate on the subsurface with a minimum of distraction. And the record can be pre-

sented in his own language, in terms of depth instead of reflection time.

The tape may be stored indefinitely for restudy in the light of new ideas without the need for costly reshooting for new information.

The final test of its worth, of course, is: "Will magnetic processing lead to discovery of traps that might otherwise elude oil finders?" The answer of a Carter geophysicist coincides with the view held by others having experience with the system.

"It hasn't found any 'extra' oil yet—we're just getting started—but we certainly expect it to."

Leases Ring Wildcat

Louisiana given $6 million for blocks near good well

BATON ROUGE.—Union Oil Co. of California and Louisiana Land & Exploration Co. paid more than $6,000,000 for leases on two sides of a promising wildcat they are drilling in the Timbalier Bay area.

The Louisiana Mineral Board announced last week that it had accepted the joint offer for two tracts covering about 4,657 acres. The acreage is on the north and east sides of State Lease 2826 where electric logs indicate the companies have tapped about 150 ft. of gas sand and 40 ft. of oil sand.

The promising test, the No. 1 State Lease 2826, is southeast of Caillou Island field between the land domains of Terrebonne and Lafourche parishes. The operator was drilling at about 13,000 ft. last week and planned to take the test to about 16,000 ft.

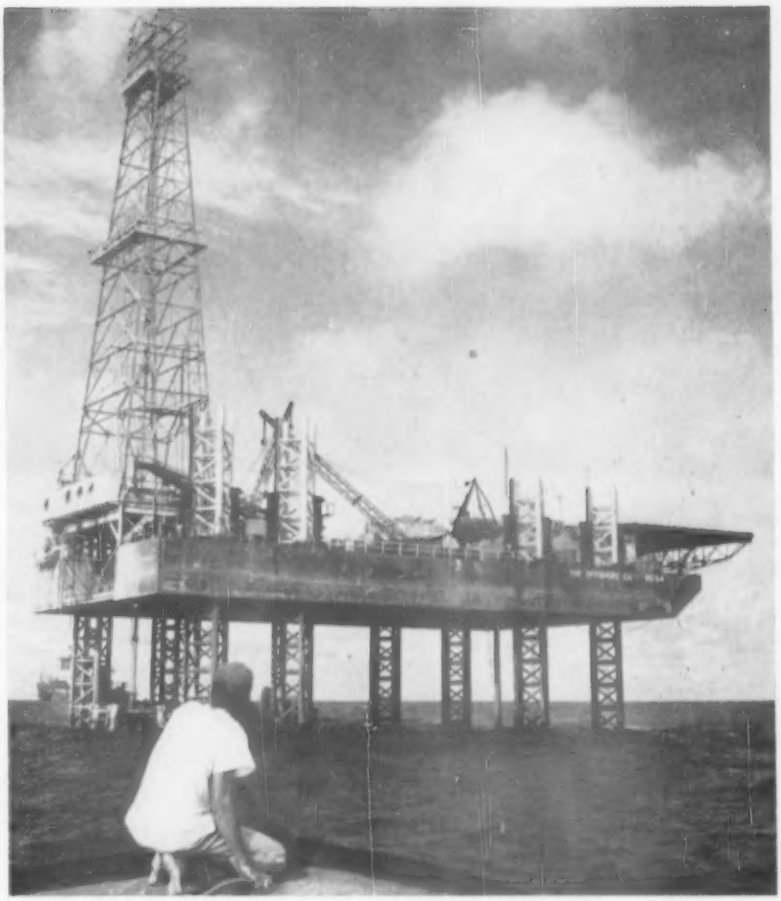
Successful bonus bid for Tract 6631, which covers about 3,270 acres just east of the wildcat, was about $4,100,000. The same companies gave $2,100,000 for Tract 6633 to the north of the wildcat block.

Phillips Sets Drilling Record

HOBBS, N. M.—Phillips Petroleum Co. toppled the New Mexico drilling-depth record last week. Its 6 Lea-Mex wildcat was bottomed at 16,842 ft. in the pre-Cambrian. Location is 2 miles east of Maljamar field in Lea County.

The well was finaled 137 ft. deeper than the former record holder, Richardson & Bass 1 Harrison-Federal in the southeastern corner of Eddy County.

Tests of the pre-Cambrian, topped at 16,824 ft., recovered only drilling mud and the water blanket. Operator was preparing to plug back to 11,400 ft. to test the Pennsylvanian. It showed oil on a drill-stem test from 11,163 to 11,208 ft.



Big rig gives expensive lease first pay as . . .

Shell, Humble Hit Offshore

Wildcat hits in 67 ft. of water 40 miles off Louisiana on a lease where two dry holes were previously drilled

MORGAN CITY, La.—Shell Oil Co. reported an offshore oil discovery last week on an expensive lease where two dry holes had been drilled earlier.

The discovery, a joint venture with Humble Oil & Refining Co., is in 67-ft. water about 70 miles south of Morgan City and nearly 40 miles from shore.

On a drill-stem test, the well produced at a daily rate of 378 bbl. of 35.9°-gravity oil and 182,000 cu. ft. of gas with no water, according to B. Dykstra, Shell vice president. Flow was through a 9/64-in. choke from a formation at 10,497-10,511 ft. Tubing pressure was 2,025 psi.

Designated the Shell-Humble OCS 0443 No. 4, the discovery is in Block 188, Eugene Island area. Two shallower tests in the same block had been drilled earlier by the two companies. Both were abandoned in salt, one at 4,050 ft. and the other at 5,529 ft.

Shell paid the federal Government a bonus of $3,308,000 for the 5,000-acre lease in 1954.

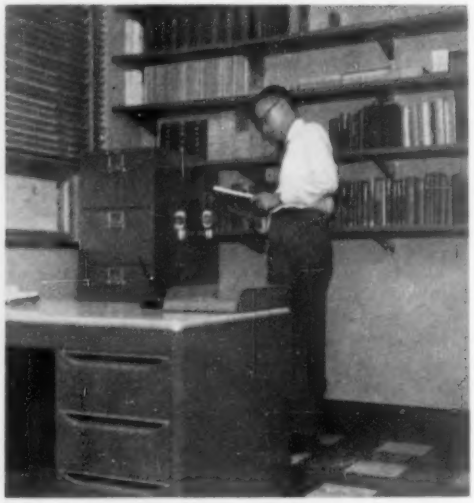
Spudded 2 months ago by Offshore Co.'s rig No. 54, the successful wildcat was drilled to 11,691 ft. The discovery well will be shut in until gathering and transportation facilities are available.

The new field is the tenth discovery in which Shell has participated off the coast of Louisiana. It is 20 miles southeast of Shell's nearest production in Block 128 field. Shell and Union Producing Co. jointly have drilled several producers in that area.

Dykstra said an offset will be drilled ¼ mile east of the new discovery, on the same lease.

OHIO OIL'S FIRST research center features a scenic setting, the most modern equipment.

ASSEMBLY ROOM features theater seats, projection booth, retractable picture screen, and sliding chalk boards.



PRIVATE OFFICES for all staff members are designed to encourage creative thinking, produce ideas.

Ohio Opens Its First Research Center

DENVER.—Usually when an oil company picks a site for a new laboratory, it gives scant attention to the scenery, climate, or cultural life of the area.

Not so with Ohio Oil Co.

Using a study made by Battelle Memorial Institute, Ohio gave these factors top consideration in locating its first oil-research center 11 miles south of here.

The reason: With no research personnel of its own, Ohio needed special attractions for prospective employes.

The new center, just dedicated, is far removed from the company's existing offices and many of its operations, but it is expected to have a strong appeal to youthful scientists. Getting and holding research talent in today's intensely competitive market is a real problem. Ohio Oil believes it has found at least a partial answer by locating its center in a setting replete with added attractions.

Ohio has had to build its entire technical staff from scientists new to the company. But its policy has been to draw only the necessary top key men from other oil companies and to rely largely on universities and the Government for the rest of its staff.

The 45,000-sq. ft. laboratory and office building are on an 80-acre site —ample for future expansion. Presently staffed by 19 scientists and 29 administrative personnel, the center will be expanded in a 2 or 3-year period to 115, including at least 75 scientists.

The staff is headed by W. H. Barlow, manager of research; W. Jacque Yost, director of research; F. H. Poettman, engineering; R. D. Russell, geology; J. E. White, physics; and L. C. Gibbons, chemistry.

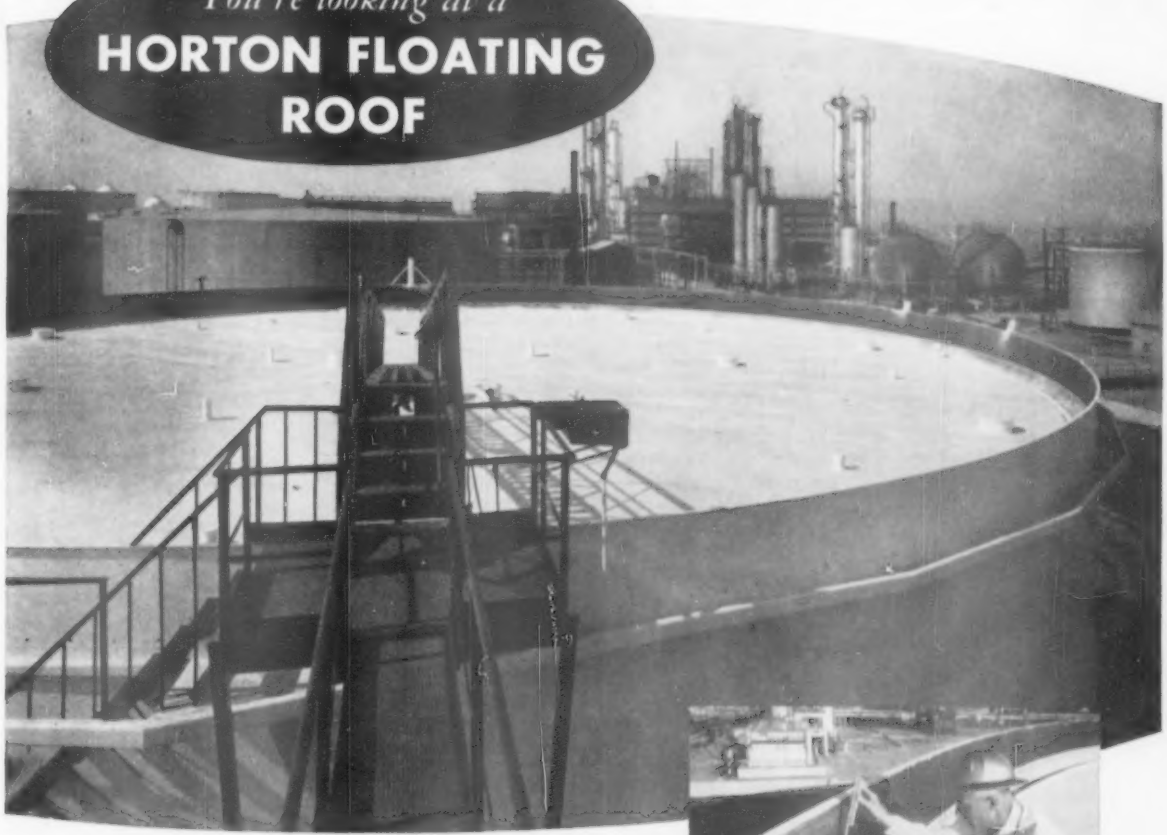
All the staff, except for the three department heads, are entirely new to private research, in accord with a company policy against pirating.

In order to stimulate independent, creative thinking, each scientist will be encouraged to devote about 10 per cent of his time to studies not necessarily related to his immediate assignment.

The center will be engaged solely in exploration and production research.

You're looking at a

HORTON FLOATING ROOF



. . . and the reason

for its **EFFICIENCY.....**

Floating directly on the surface, the entire bottom of a Horton® Floating Roof is normally in contact with the liquid in the tank. There is no air-vapor mixture above the liquid to be vented and lost. The space between the rim of the roof and the tank shell is efficiently closed by a Horton Seal to prevent vapor from escaping.

Horton Floating Roofs are built in three types—Double-Deck, Pontoon and Pan. Write our nearest office for further information . . . and be sure to ask for a copy of the Underwriters Laboratories report approving Horton Floating Roofs.

The man in the view above is holding a carpenter's rule against the side of the tank to demonstrate the snug fit of the Horton Seal. A continuous sealing ring with vertical flexures every 22 inches allows the ring to conform perfectly to the tank shell.

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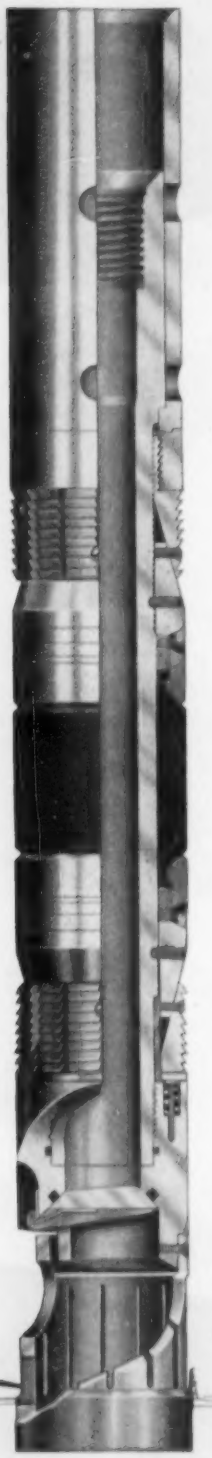

BAKER PACKERS ADD PERMANENCE TO PERMANENT-TYPE WELL COMPLETIONS

When you select a Packer for a Permanent-Type Well Completion, remember this fact: of all the tools used in permanent-type well completions, only the *Packer* is required to be *permanent*. Guns, Extensions, Plugs, Gas-Lift and Circulating Valves can be removed or replaced on wire line . . . but the Packer, like the casing, is required to perform for the life of the selected producing intervals. Baker Packer Completions are Permanent Completions from the standpoint of packer performance.

Advantages of Baker Retainer Production Packer in Permanent-Type Well Completions:

PERMANENT, RELIABLE PACK-OFF will hold against any pressure differential from above or below that is safe for the casing.

FREE TUBING STRING . . . neither set-down tubing weight nor tubing tension required to achieve and maintain pack-off. Tubing can be anchored to Packer if desired.

CAN BE USED AS A SQUEEZE OR A PRODUCTION TOOL.

MEETS PERMANENT-TYPE WELL COMPLETION DIMENSIONAL REQUIREMENTS.

CAN BE SET ON WIRE LINE. PERMITS EASY REMOVAL OF TUBING STRING.

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Tanker Rates Spurt Up

Sudden chartering activity in London boosts U. S. market to near record; Persian Gulf-to-Europe rates set pace

NEW YORK.—The waiting game which oil tanker charterers have played with ship owners for weeks came to an abrupt end last week. Increased activity on the London chartering market spurred a sharp increase in tanker rates in the United States.

The U. S. tanker market, already generally firm, has inched upward since the Suez Canal crisis, but charterers have delayed contracting for vessels long past the normal fall season. There has been a concerted move to resist the high rates owners have asked. Last week the dam broke.

To some extent the move was prompted by increased activity on the London market as charterers in Europe moved more strongly into the Caribbean-to-Europe trade. This has been a marked trend since the Suez crisis, but Europeans began chartering vessels in earnest last week.

Reaction quick . . . The effect on the U. S. tanker market was almost immediate. The rate asked—and received—for vessels in the Venezuela or Caribbean-to-New York run jumped to USMC plus 100 per cent. This is almost the peak reached in January of this year—the highest level since the Korean war.

Vessels in this oil trade last week were bringing $5.70 a ton. This compares with an average figure of $3.85 for the first 6 months of the year. It is a jump of $1.45 a ton over charters made in the previous week.

Oil shippers normally begin making heavy shipments from Venezuela and Gulf Coast shortly after Labor Day in anticipation of the heating season on the East Coast of the U. S. This movement, and its corresponding upsurge in the tanker market, did not take place until last week.

The Gulf Coast-to-New York tanker rates took the same sort of a jump that the Venezuelan-Caribbean-to-New York rates exhibited, but not to the same extent. Owners were chartering vessels for the Gulf-New York run last week at USMC plus 72½ per cent, or $4.92 a ton. This compares with an average the first 6 months of this year of USMC plus 36 or $3.87 a ton.

The sharpest jumps came in rates for both the Caribbean and Persian Gulf routes to the United Kingdom and Western Europe. There has been a decided lag in spot charters for the Persian Gulf-United Kingdom run since the Suez crisis. A corresponding increase has appeared in charters for the Caribbean-United Kingdom run.

Last week the Caribbean-to-Britain voyage was bringing a rate of scale plus 110 per cent, or $9.54 a ton, compared with scale plus 60 per cent, or $7.30 a ton at the first of this year. The Persian Gulf-to-Britain trip last week jumped to scale plus 250 per cent or $24.38. This compares with scale plus 90 per cent or $12.27 early this year.

The outlook . . . There are always sharp fluctuations in the spot tanker market as the market is influenced by seasonal demands for oil and the availability of tankers.

Since only about 10 per cent of the world's oil shipments move in tankers which are chartered on a spot basis, the over-all influence of the spot market can easily be overrated.

It does have a marked influence on the rates paid for time charters and consecutive voyage charters, however. Most of the oil moved today is shipped in either tankers chartered on a long-term basis or in company-owned vessels.

The new strength which the spot charter market has shown in the past year has been reflected in both the time charter market and also in charters for consecutive voyages. In late October tankers chartered for a 5-year period were bringing $4.75 a ton for the charter period, an increase of 75 cents from charters made only a week or 10 days previously. In January of this year, owners were chartering for 5 years for $3.90 a ton.

Increased oil demand the world over, plus the threat of a possible shutdown of the Suez Canal, have served to push oil-company tanker construction at even a faster pace than before.

Supertankers speeded . . . The trend toward supertankers large enough to make an economical run around the Cape of Good Hope on the voyage from the Middle East to Europe is being accelerated.

The Royal Dutch-Shell group announced last week it has decided to increase the size of nine tankers already on order. They were meant to be 32,500-ton vessels which could easily travel the Suez Canal. Now Shell has decided to increase four of them to 40,000 tons, two to 46,000 tons, and three to 60,000 tons.

Big Gulf Blowout Set for Kill

ABBEVILLE, La.—The worst blowout ever experienced at a well in the Gulf of Mexico may be brought under control this week.

A directional hole being drilled by Union Oil Co. of California had probed within 150 ft. of the wild well late last week. After setting 7-in. heavy-duty pipe at about 10,400 ft. in the directional well, the operator was preparing to resume drilling at last report.

The drilling crew, which has been at work on the relief well since mid-July, expects to know almost immediately when the bit taps the wild well. A fluorescent material has been added to the drilling mud to signal the "communication" on the surface of the water 1,500 ft. away.

Sparkling contact . . . When the water around the flare from the wild well starts to sparkle it will mean the two holes have made contact.

The wild well is the A-1 O.C.S.-0297, in Block 26, Vermilion area. It blew out June 7 when it hit a high-pressure sand at 11,435 ft.

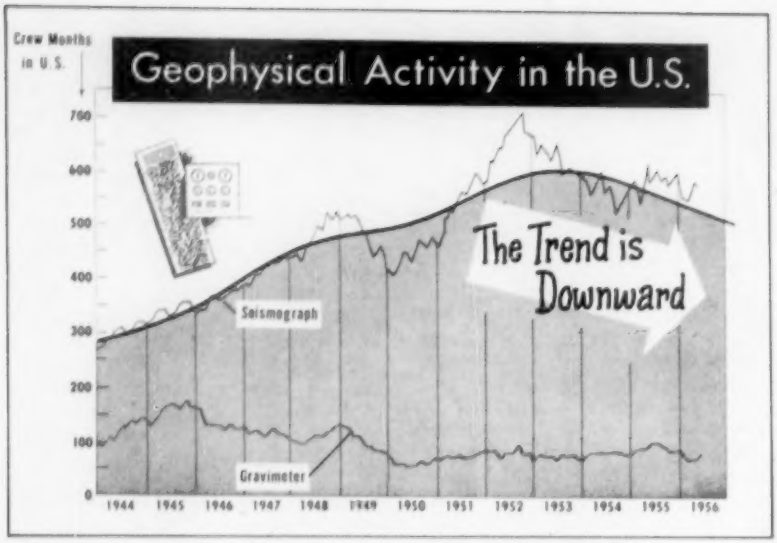
Pressure of the gas pounding against the drilling platform toppled the structure into 25-ft. water about 7 miles south of Pecan Island field.

The relief well is being drilled from a new platform which was erected after the blowout occurred. It is 1,500 ft. northeast of the blowout.

Costly operation . . . Stuck drill pipe and frequent surveys required in the intricate directional-drilling job are making it an unusually slow and costly project *(The Oil and Gas Journal, September 3, page 77)*.

The bottom of the directional hole last week was believed to be about 100 ft. up and 75 ft. to the side of the proposed point of contact with the old well. The operator hopes to hit the wild well at the bottom of the 9⅝-in. casing, which had been run to 10,500 ft.

The 7-in. casing which was cemented in place last week is designated as P-160 and was said to be the highest-pressure pipe available for the job. Because the casing is so stiff, the directional hole had to be reamed to 12 in. in diameter before it could be lowered to the bottom.



Seismic Work Still Off

New techniques for finding strat traps would make it a workhorse again, but many factors work against it now

GEOPHYSICAL activity is still dropping.

At a time when more exploration money is being spent than in any other period in history, use of this method seems over the hump and on a downward grade.

In the United States, geophysics seems to be entering an era of diminishing returns; its cost is increasing too rapidly in relation to the value of the crude oil found.

There are many reasons given for the slump in seismic activity, which began late in 1952 (see chart). Some of these are:

... **Greater reliance on fracturing** and secondary recovery for the development of "new" sources of oil.

... **Increased dependence on geology** instead of geophysics as a less hazardous means of increasing oil reserves.

... **Failure** of the average exploration man to understand and to use geophysics to its fullest advantage.

... **Lack of confidence** by top management in geophysics.

... **Possible need** to capitalize geophysical expenditures when land is condemned, and, possibly most important,

... **Today's excess** of crude oil in the United States.

The downward trend of geophysical activity in the United States could be quickly reversed with new developments which would enable geophysics to find and outline strat traps with the success and accuracy that it now finds and measures structural reservoirs.

World-wide picture . . . The decline in exploration by geophysical methods was not marked for the world as a whole in the first half of 1956.

It was off only 1.9 per cent from the 1955 average. But the decline in the U.S.—5.6 per cent—was significant. The declines in the U.S. and Canada were more than enough in the aggregate to offset a 6.2 per cent gain in the Eastern Hemisphere.

These are the salient figures of the semiannual report of the Society of Exploration Geophysicists, to be presented this week by Homer C. Patrick, Humble Oil & Refining Co., at the society's annual meeting in New Orleans. Here are some significant excerpts from the report:

... **Europe:** France, Italy and Germany, particularly the first two, showed more activity. Germany's severe winter restricted work there. Nineteen crews were operating in Italy and Sicily alone at the end of June. Work was also done in Austria, Greece, Netherlands, Portugal, Spain, and the United Kingdom.

... **Africa:** Seismic work was up 50 per cent and gravity work 25 per cent in Africa, much of it in French Africa. Work was also under way in Angola, Belgian Congo, British Somaliland, East Africa, Egypt, Libya, Nigeria, and Somalia.

... **Middle East:** Israel, Iraq and Saudi Arabia witnessed the greatest concentration of geophysical work in the Middle East and there were significant increases in Turkey. Some is going on in Jordan as well as Aden, Dhofar, Iran, Kamaran, Kuwait, Persian Gulf, and Qatar.

... **Far East:** Incomplete reports available indicate a decrease in the Far East. Greatest activity is concentrated in Australia, Netherlands New Guinea, West Pakistan, India and Papua. Exploration was also being conducted in Indonesia, New Zealand, East Pakistan, Japan and the Philippines and, it is believed, in Burma.

... **South America:** Venezuela leads South America in exploratory operations but activity continues high in Argentina, Brazil and Colombia and to a lesser degree in Bolivia, Chile, Peru, Uruguay and Trinidad.

... **Central America:** Expected increases in Central America have yet to develop with some activity in Cuba, Jamaica and the Bahamas.

... **Canada:** There was a small increase in seismic operations in Canada but it was more than offset by the marked drop in gravity work. Most of the operations were in western Canada, Alberta, British Columbia and Saskatchewan ranking in that order.

... **United States:** All categories of geophysical exploration declined in the U.S., seismic, 3.3 per cent; gravity, 18.1 per cent, and magnetic, 50 per cent, a weighted drop of 5.6 per cent.

Crew Months of Geophysical Exploration for Petroleum

	U.S.A.			Canada			Western Hemisphere			Eastern Hemisphere			World		
	1955	1956 6 mo.	Change in rate (%)	1955	1956 6 mo.	Change in rate (%)	1955	1956 6 mo.	Change in rate (%)	1955	1956 6 mo.	Change in rate (%)	1955	1956 6 mo.	Change in rate (%)
Seismic	7,090	3,429	—3.3	1,496	751	4.0	9,395	4,590	—2.3	1,589	836	5.2	10,984	5,426	—1.2
Gravity	1,074	440	—18.1	103	28	—45.6	1,431	621	—13.2	621	327	5.3	2,052	948	—7.6
Magnetic	76	19	—50.0	....	....	....	146	65	—10.9	173	84	—2.9	319	149	—6.6
Other	....	....	....	....	....	....	15	16	113.3	60	50	66.7	75	66	76.0
Total	8,240	3,888	—5.6	1,599	779	—2.6	10,987	5,292	—3.7	2,443	1,297	6.2	13,430	6,589	—1.9

Importers Step Up Hauls

September-October imports show gains, declines scheduled for rest of year; but flow may hit new peaks next year

AUSTIN. — Importing companies increased their crude hauls into the United States for September by 19,900 bbl. daily above estimates, latest reports to the Texas Railroad Commission reveal.

Their estimates for October crude imports also have been revised upward by 25,500 bbl. daily. However, at the same time November and December estimates have been sliced with an upward revision again noted for January.

What Importers Told the Railroad Commission

(Thousands of barrels daily)

	Actual*		Estimated or forecast*				
	Sept. 1955	Sept. 1956	Oct. 1956	Nov. 1956	Dec. 1956	Jan. 1957	Feb. 1957
CRUDE—EAST COAST:							
Atlantic Refining Co.	57.6	80.2	68.3	68.3	68.3	68.3	68.3
Cities Service Co.	16.4	14.9	35.2	28.2	28.1	27.9	28.8
Eastern States Petroleum Co.	25.8	8.4	27.0	24.0	22.5	22.5	22.5
Gabriel Oil Co.		6.5	7.1	7.3	7.1	7.1	7.9
Gulf Oil Corp.	141.0	138.0	141.0	138.0	133.0	132.0	132.0
Hancock Oil Co.			4.0		4.0		
Lake Superior Refining Co.		4.2	5.1	5.3	5.2	(§)	(§)
McBride Oil & Gas Corp.	3.9		(§)	(§)	(§)	(§)	(§)
Phillips Petroleum Co.	13.0	13.0	11.7	12.1	11.7	11.7	13.0
San Jacinto Petroleum Corp.		4.1		1.6	1.6	1.8	1.8
Signal Oil & Gas Co.		1.8	1.8	1.8	1.8	(§)	(§)
Sinclair Oil Corp.	76.3	76.5	77.4	72.3	66.3	75.0	75.0
Shell Oil Co.	1.1						
Socony Mobil Oil Co., Inc.	60.9	61.8	84.5	72.5	72.5	76.7	76.7
Sohio Petroleum Co.	1.6	4.3	3.4	3.5	3.4	3.4	3.8
Southwestern Oil & Ref. Co.	3.7	3.8		3.8	3.6		(§)
Standard Oil Co. of California	76.3	76.9	76.1	76.1	76.1	76.1	76.1
Standard Oil Co. (Ind.)	12.2	27.7	10.1	25.8	29.8	34.3	37.5
Standard Oil Co. (N. J.)‡	95.0	91.0	77.0	77.0	77.0	79.0	79.0
Sun Oil Co.	37.3	67.7	47.9	56.7	58.5	54.2	63.4
The Texas Co.	57.5	62.9	61.3	58.8	79.6	72.5	77.2
Tidewater Oil Co.	15.6	35.1	25.8	37.5	35.6	58.8	54.5
Total East Coast	695.2	778.8	764.7	770.6	785.7	801.3	*817.5
CRUDE—WEST COAST:							
Shell Oil Co.	10.7	49.5	49.7	37.4	46.7	36.1	49.0
Socony Mobil Oil Co., Inc.	26.8	39.8	27.2	33.0	33.4	37.5	37.5
Standard Oil Co. of California	17.0	35.0	34.1	34.1	34.1	34.1	34.1
The Texas Co.	11.7	22.6	25.6	9.8	23.4	18.9	24.6
Tidewater Oil Co.	36.8	42.8	52.3	35.9	42.0	54.1	43.9
Union Oil Co. of California		10.0	18.0	18.0	18.0	14.0	14.0
Wilshire Oil Co.		16.6	17.4	18.3	16.6	16.6	16.6
Total West Coast	103.0	216.3	224.3	186.5	214.2	211.3	219.7
Total crude	798.2	995.1	989.0	957.1	999.9	1,012.6	1,037.2
PRODUCTS:							
Asiatic Petroleum Co.	4.2	6.9	3.7	4.7	4.3	7.2	4.8
Eastern States Petroleum Co.	18.0	8.4	10.0	10.0	10.0	10.0	10.0
Gulf Oil Corp.	6.0	8.0	5.0	7.0	7.0	7.0	7.0
Shell Caribbean Petroleum Co.¶	86.0	92.0	126.0	163.0	194.0	207.0	219.0
Shell Oil Co.	22.8	22.5	26.1	20.9	27.0	23.8	27.4
Sinclair Oil Corp.	2.6	1.1					
Socony Mobil Oil Co., Inc.	5.7	11.0	11.4	11.4	11.4	11.4	11.4
Standard Oil Co. of California		6.3	8.9	8.9	8.9	8.9	8.9
Standard Oil Co. (Ind.)‡	16.2	17.2	31.8	32.4	40.6	32.3	35.7
Standard Oil Co. (N. J.)**	99.0	153.0	252.0	252.0	252.0	261.0	261.0
The Texas Co.		9.0	2.0	4.8	4.0	4.0	
Total products	260.5	335.4	476.9	515.1	559.2	572.6	585.2
Total crude and products	1,058.7	1,330.5	1,465.9	1,472.2	1,559.1	1,585.2	1,622.4
Bonded fuel included‡	61.5	110.2	99.0	98.1	98.4	99.4	98.8

*From company reports to the Texas Railroad Commission. †Based on quarterly estimates. ‡Received through suppliers who can furnish either domestic or foreign oil. §No forecast reported. ¶Imported by independent distributors. ‡Mostly duty free for bunkering ships in foreign trade. **Includes bonded drawback for foreign flag international bunkers as follows: September, 63,000 bbl. daily; fourth quarter, 1956, and first quarter, 1957, 55,000 bbl. daily.

Actual September crude imports to both coasts totaled 995,100 bbl. daily compared to an earlier estimate of 975,200 bbl. daily. Imports for September 1955 were 798,200 bbl. daily.

Over-all effect of the latest reports is a slight downward revision in estimates for the September-January period. The companies expect to import an average of 990,700 bbl. daily during the period compared to earlier estimates of average hauls of 998,600 bbl. daily.

New estimates for November and December hauls removed those months from the million-barrel class. The companies now estimate they will take 957,100 bbl. daily in November compared to earlier estimates of 1,027,100 bbl. and will bring in 999,900 bbl. daily in December compared to 1,015,500 bbl. estimated earlier. This may leave July as the record importing month of the year. Companies imported 1,009,200 bbl. daily that month.

Picture for year . . . The new reports also give a clearer picture on imports for the year.

With actual imports available for 9 months and estimates on the remaining 3, it appears crude imports for 1956 will average 908,000 bbl. daily. This is a 20.4 per cent gain over the 754,200 bbl. daily imported in 1955.

Biggest gains were recorded on the West Coast. The 1956 imports there apparently will average 175,900 bbl. daily compared with 85,100 bbl. daily last year. This is a 106.7 per cent increase.

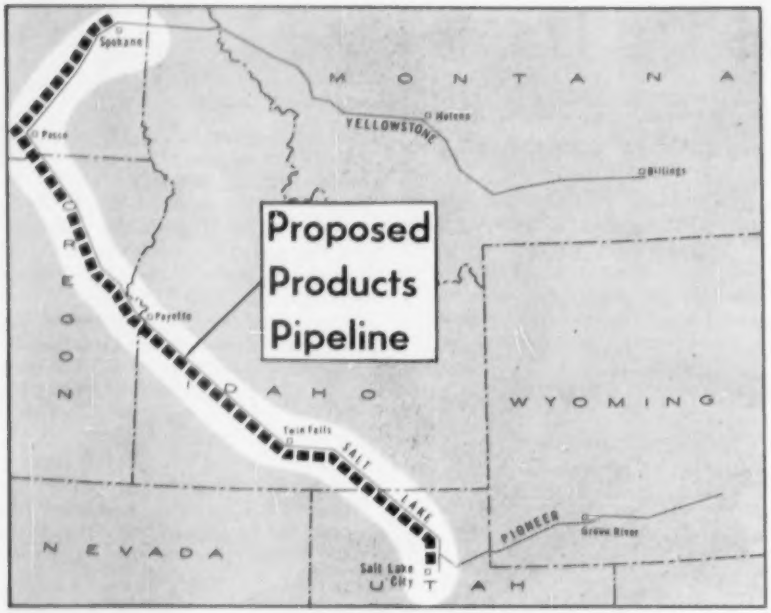
On the East Coast the import gains this year may average a modest 9.4 per cent. Imports this year will be about 732,100 bbl. daily compared with 669,100 bbl. daily last year.

Heavy next year . . . There's also an indication that imports may continue heavier in 1957.

Estimates of the companies for January and February show big gains over the same months this year. Estimates for January total 1,012,600 bbl. daily compared with 730,500 bbl. this year. For February the estimates are 1,037,200 bbl. daily compared with 785,200 bbl. daily actually imported this year.

The story on products imports is a decline in September and October with upward revisions for the other 2 months of the year. Actual product imports for September were 335,400 bbl. daily compared with previous estimates of 336,200 bbl. daily.

Products imports for October are estimated at 476,900 bbl. daily. They will increase gradually every month to a high estimate of 585,200 bbl. daily next February.



NEW PIPELINE talked by four big companies would run from the expanding Salt Lake City refining area to Spokane. It would parallel present products-line facilities and shows that . . .

Refiners Look to Northwest

SALT LAKE CITY.—A second products pipeline may be built from Salt Lake City to Spokane to serve the expanding market of the Pacific Northwest.

Exploratory talks are being conducted by Standard Oil Co. (Ind.), Phillips Petroleum Co., Sinclair Oil Corp., and Continental Oil Co. Officials said the project is only in the preliminary stage. There has been no decision on whether to go ahead with it.

The proposed pipeline would parallel the 700-mile system of Salt Lake Pipe Line Co., a subsidiary of Standard Oil Co. of California (see map). This 6 and 8-in. system has been looped along more than half of its length. Its capacity is 45,500 bbl. per day from Salt Lake City to Boise and 24,500 bbl. the rest of the way to Spokane.

The companies considering the new line, or their affiliates, now ship products through the Salt Lake pipeline. Phillips and Utah Oil Refining Co., a subsidiary of Standard of Indiana, have refineries at Salt Lake City. The Continental-Sinclair products line from Sinclair, Wyo., is linked with the Salt Lake line. Continental and two other refineries move products west to Spokane from the Billings area through Yellowstone pipeline.

Competition for market . . . While the official position is still that the proposed line "may or may not be built," it spotlights the fact that competition in the Pacific Northwest is waxing hotter.

The market plum once belonged solely to California refiners. But it's falling more and more to refiners of Canadian crude in Washington and Rocky Mountain crude in Utah, Wyoming, and Montana.

It was formerly served by tanker up the Pacific Coast, then up the Columbia River. That picture changed completely, however, with the construction of products lines from the Rocky Mountains and the Trans Mountain pipeline moving Alberta crude into Washington.

Washington is fast shaping up as the nation's newest major refining center with almost 100,000 bbl. daily in crude capacity. Refineries in the works for Standard of California, The Texas Co., and U. S. Oil & Refining Co., could double that figure. Alberta producers are looking to the area as one of the prime outlets for their rising production.

Rocky Mountain production also is growing. And it has its eye on the same market. Salt Lake City refiners may have more crude available next year from newly discovered reserves in the Four Corners area through the 15,000-25,000-bbl. crude-products line planned by Northwest Pipeline Corp. *(The Oil and Gas Journal, October 8, page 121).* A new products line to Spokane would provide an outlet for the increased refinery output at Salt Lake City.

Gulf Converts Line

Project will bring L.P.G. from West Texas to coast

MIDLAND, Tex.—Gulf Oil Corp. started work here last week on the first phase of its plan to convert an old 8 and 10-in. crude line to the Gulf Coast to L.P.G. service.

The company is laying 46 miles of line to move L.P.G. from its Waddell processing plant in Crane County to Midland. The new line will funnel products into the converted 8 and 10-in. which extends from Midland to Lufkin in Angelina County in East Texas via Ranger and Weatherford.

Gulf will lay 125 miles of 10-in. south from Lufkin to a terminal at Barbers Hill on the Gulf Coast. Barbers Hill is atop a salt dome in northwestern Chambers County between Houston and Beaumont.

A lateral line to tap L.P.G. production from natural-gasoline plants in Southeast New Mexico also is planned. Another tie-in is scheduled at Coahoma, Tex., near Big Spring to a Warren Petroleum Corp. line from the Snyder area to the north.

Other projects . . . The Gulf project is the second old West Texas-to-Gulf crude line to be converted to L.P.G. Magnolia Petroleum Co. completed a similar conversion of an 8 and 10-in. line from Midland to Beaumont early this year.

Prospects are that a third such conversion will take place soon. Phillips Petroleum Co. is reported planning such a move for its 10-in. line from West Texas to Sweeny. Spraberry crude now making up the bulk of deliveries through this line would be diverted to the jointly-owned Rancho system. Capacity of Rancho is being increased.

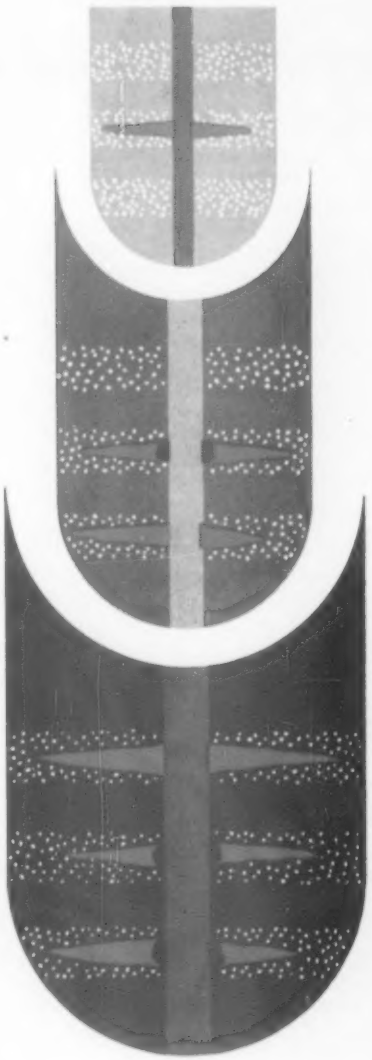
Tax Title Only Skin Deep

CHEYENNE, Wyo.—Rights to oil and gas deposits underlying Wyoming lands sold for nonpayment of taxes are not transferred to the purchaser, according to a decision of the Wyoming Supreme Court.

The precedent-setting ruling upheld a District Court award of oil and gas rights on 120 acres to Milliron Oil Co. and surface rights to Robert Connahan and others.

The tribunal held invalid the defendant's claim that they received title to minerals simply because they acquired a tax title that resulted in sale of the land for nonpayment of taxes. The Supreme Court said minerals are not subject to taxation until produced and their value assessed.

fractures zones that can't be isolated



HALLIBURTON'S MULTIFRAC

Many a well that shows promise . . . but fails to keep it . . . may be multiple-fractured the Halliburton way to increase production profitably. Well conditions may be such that packers cannot be used to isolate individual zones. Continued injection may simply extend existing fractures, making additional fracturing economically questionable. However, if these fractures are temporarily plugged, pressure build-up acts to establish a new fracture at a different elevation. Alternating this procedure with conventional fracturing methods using Halliburton's continuous Multifrac process, obtains and extends additional fractures at different levels.

Multiple Fracturing In Open Hole and Casing

MULTIFRAC does not require segregation of individual sections. Production has been greatly increased by using MULTIFRAC applications where portions of open hole are too large or otherwise unsuitable for packers . . . where oil bearing sections have great thickness . . . where series of perforations in casing are closely spaced.

AIDS RECOVERY

In such cases multiple fracturing with MULTIFRAC often puts oil in the tanks that might not otherwise be recoverable. Your nearby Halliburton field representative has all the facts. Just call the local or district office of the Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

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Octanes Hold Familiar Upward Course

RESEARCH octane numbers continued in their familiar upward pattern during the third quarter of the year, according to the latest Du Pont survey.

The national weighted premium average inched up three-tenths of a point to 96.8 on the October report, while the average for regular went to 89.5, up a tenth of a point from the July figure.

Combined premium and regular weighted average for the total United States gasoline pool was 91.7 octane numbers, a gain of two-tenths of a point. Five new cities joined the list of those with average premium octane numbers of 97 or higher. This brings the total to 20.

Highest premium average in the country was in Houston, where samples tested out at 98 octane. Next in line were Atlanta, Baltimore, Dallas, and Fort Worth, each with a rating of 97.8 octane numbers.

Pittsburgh had the highest average in the regular field with 92.2 numbers. Baltimore and Boston were tied at 92.1 for second place. The highest regular sample tested 94.4 octane numbers.

Montreal led Canada in both grades. The city averaged 96.8 for premium and 91.1 for regular.

Du Pont's Yardstick of Third Quarter

(Octane numbers are by research method, arithmetic averages by cities)

	PREMIUM				REGULAR			
	Octane number			TEL cont. cc./gal.	Octane number			TEL cont. cc./gal.
	Oct. 1955	July 1956	Oct. 1956	Oct. 1956	Oct. 1955	July 1956	Oct. 1956	Oct. 1956
Aberdeen	93.8	95.1	95.0	2.39	86.4	88.5	88.2	1.96
Albuquerque			95.7	2.58			85.1	2.10
Amarillo	96.0	96.8	96.1	2.44	86.7	87.8	87.3	1.91
Atlanta	96.8	97.0	97.8	2.26	88.2	88.9	89.2	2.59
Bakersfield	94.3	95.1	95.4	2.93	85.7	85.7	86.2	2.65
Baltimore	97.3	97.1	97.8	2.80	91.0	91.4	92.1	2.77
Boise			96.1	2.41			85.8	2.04
Boston	96.7	97.0	97.6	2.31	90.6	91.7	92.1	2.43
Calgary	90.9	91.2	92.6	2.44	84.2	85.5	85.6	2.25
Casper	92.1	94.1	94.2	1.79	85.3	86.2	86.3	1.66
Charlotte	96.4	96.9	97.5	2.31	88.4	88.8	88.9	2.54
Chicago	94.8	97.2	96.8	2.76	88.5	90.8	91.4	2.61
Cincinnati	95.3	97.0	97.2	2.30	90.1	91.2	91.3	2.35
Cleveland	95.0	96.0	96.9	2.65	90.3	91.8	91.7	2.43
Columbus	94.8	96.3	96.8	2.46	89.8	91.4	91.4	2.33
Corpus Christi	96.9	97.3	97.5	2.85	87.9	88.6	88.7	2.50
Dallas—Fort Worth	97.2	97.4	97.8	2.51	87.6	88.7	88.8	2.46
Davenport	94.1	95.6	95.6	2.52	86.4	88.5	88.4	2.49
Denver	91.7	93.7	93.8	2.23	85.2	85.8	85.6	1.88
Des Moines	94.0	96.2	95.7	2.69	86.2	87.9	88.0	2.26
Detroit	95.1	96.8	96.7	2.56	89.8	91.3	91.6	2.32
Edmonton	91.6	92.2	92.3	1.92	84.9	85.2	86.7	1.63
El Paso	95.6	95.2	96.0	2.15	85.8	85.4	85.8	1.77
Great Falls—Billings	94.0	94.7	94.5	1.76	86.6	87.1	87.0	1.87
Houston	96.8	97.4	98.0	2.66	88.1	89.2	89.6	2.30
Indianapolis	94.9	96.8	96.8	2.55	88.7	90.3	90.2	2.35
Jacksonville	96.5	96.8	97.6	2.43	89.8	90.8	90.8	2.41
Kansas City	94.3	96.1	95.8	2.19	84.3	88.6	88.4	2.09
Little Rock	97.5	97.3	97.3	2.47	89.2	89.2	88.9	2.36
Los Angeles	95.6	96.5	96.4	2.56	86.3	86.1	86.0	1.43
Louisville	96.4	97.1	97.4	2.56	89.1	89.6	89.7	2.62
Memphis	97.0	97.3	97.4	2.70	89.2	89.1	89.3	2.46
Milwaukee	95.2	96.7	97.0	2.53	88.8	91.1	91.2	2.39
Minneapolis	94.4	96.2	96.1	2.58	86.2	88.4	88.1	1.99
Montreal	94.3	95.8	96.8	2.54	88.3	90.2	91.1	2.24
Nashville	97.0	97.0	97.2	2.68	89.1	88.8	89.1	2.50
New Orleans	96.8	96.8	97.6	2.60	88.6	88.8	89.1	2.29
New York	96.8	97.3	97.7	2.70	91.0	91.5	91.9	2.57
Omaha	94.2	96.1	95.6	2.64	86.2	88.1	87.9	2.39
Philadelphia	96.6	96.9	97.3	2.54	90.9	91.9	91.8	2.43
Pittsburgh	96.4	96.8	97.4	2.42	90.9	91.8	92.2	2.65
St. Louis	94.3	96.2	95.8	2.48	86.5	88.4	88.1	2.50
Salt Lake City	92.5	92.4	93.6	1.55	82.4	82.1	83.1	1.67
San Francisco	95.8	96.7	96.7	2.61	87.3	86.7	87.0	1.64
Seattle	95.4	96.3	96.4	1.85	86.6	86.7	87.2	0.79
Shreveport	97.1	97.3	97.1	2.67	88.4	89.1	89.1	2.61
Spokane	95.3	96.1	96.3	1.93	86.8	86.7	87.3	1.15
Toronto	94.7	95.2	96.2	2.64	88.5	89.7	90.2	2.18
Tulsa—Oklahoma City	94.2	96.3	95.8	2.53	86.2	88.4	88.5	2.22
Vancouver	94.2	95.2	96.0	1.85	85.0	86.9	87.5	0.69
Wichita	93.9	96.0	95.9	2.60	86.2	88.3	88.0	2.50
Winnipeg	93.8	94.7	95.7	2.56	86.2	88.6	88.7	1.58

SHIFTS IN OCTANE RATINGS
(Cities per octane group)

Octane group—	Oct. 1954	Oct. 1955	July 1956	Oct. 1956
Premium				
97 Research and over		6	14	19
95-96.9	2	21	29	27
93-94.9	24	18	4	4
91-92.9	17	4	3	2
Below 91	5	1		
Total tested	48	50	50	52
Regular				
92 Research and over				3
90-91.9	1	7	14	12
88-89.9	8	17	21	20
86-87.9	13	17	7	11
Below 86	26	9	8	6
Total tested	48	50	50	52

The latest national weighted TEL dosage for both premium and regular showed a slight drop from July. Premium dosage was down from 2.46 cc. to 2.45 cc., and regular dropped from 2.35 to 2.32 cc. Dosage for the national combined pool was 2.36 cc.

Samples for the latest Du Pont survey were taken from service stations in 49 cities in the United States and six in Canada. Some 784 fuel samples, 389 premium and 395 regular, were picked up between September 26 and October 3.

The small tables at the top of page show the octane ranges where the growth has occurred.

Sinclair Seeks Funds

Company planning biggest financing move in history

NEW YORK.—Sinclair Oil Corp. last week made public its plans to issue more than $170 million in debentures, the largest financing venture in the company's 40-year history.

The move is being taken to provide capital for a number of expansion projects, several of them already undertaken.

P. C. Spencer, Sinclair president, said Sinclair's normal capital expenditures for 1956 are expected to total $151 million and will be an estimated $170 million in 1957.

A large portion of the capital expenditure for 1956 was included in Sinclair's $42,500,000 purchase of the oil and gas producing properties of Southern Producing Co. and the $47,464,000 which Sinclair paid for a 30.45 per cent interest in Texas Pacific Coal & Oil Co.

Spencer said Sinclair's stockholders will be asked at a special meeting October 30 to authorize the board of directors to make the new debentures convertible into common stock.

Refinery "Firmed Up"

Turkish American to start work on 15,000-bbl. Istanbul plant early next year despite opposition of four majors

TURKISH AMERICAN OIL CO. expects to break ground for its 15,000-bbl. refinery near Istanbul shortly after the first of the year.

Frank D. St. Hilaire, one of the founders and organizers of Turkish American, said last week that M. W. Kellogg Co., New York, will handle engineering, procurement, and construction of the plant. Formal contracts for the work are being negotiated.

Process units to be included in the refinery and capacities on a stream-day basis are as follows:

. . . 16,600-bbl. atmospheric topping unit.

. . . 6,400-bbl. crude vacuum unit.

. . . 2,400-bbl. visbreaking unit.

. . . 4,900 fluid catalytic cracking unit with complete gas recovery.

. . . 480-bbl. catalytic polymerization unit.

. . . Gasoline and kerosine treating facilities.

In addition to the process units, the refinery will have all facilities for power generation and for steam, truck, rail, and marine-loading facilities. It will operate on either Saudi Arabian or Iraqi crude and will process Turkish crude as soon as it is available.

St. Hilaire said last week he expects the following product yields from an operation based on average 34-36°-gravity Middle Eastern crude:

	Per Cent
Motor gasoline (85 Research Octane Number)	39.4
Kerosine	19.8
Diesel fuel	19.5
Heavy fuel oil	16.2
L.P.G.	4.1

Rival plan . . . The newly formed Turkish American will build its refinery whether a second major refinery proposal for the country is approved or not. Four major companies now have representatives in Ankara seeking government approval for a plan to build a 60,000-bbl. refinery in the country.

Two of the four, Socony Mobil Oil Co. and California Texas Co. (Standard Oil Co. of California and The Texas Co.) are major marketers in Turkey. They have been joined in the project by British Petroleum Co., Ltd., and the Royal Dutch-Shell Group.

Turkish American received approval for its refinery from the Turkish Government more than 5 months ago under Turkey's Foreign Investment Law. The major companies are seeking to enter Turkey's refining picture through a revision in the country's petroleum law, which at present applies only to exploration and producing activities.

Capital divided . . . About two-thirds of Turkish American's total $18 million investment in the refinery is being supplied by private investors in the United States. The remainder is being put up by private Turkish investors.

The refinery will be built on a 300-acre site about 40 miles from Istanbul on the Asiatic side of the Sea of Marmara. Headquarters for the company will be at Istanbul. Operating and management personnel will number about 230, with only 12 per cent of them Americans.

St. Hilaire estimated last week that the refinery will save dollar-short Turkey from $12,000,000 to $15,000,000 a year in foreign exchange when it is in full operation on imported crude. The dollar saving will be higher if and when Turkish crude is available to the refinery. The plant is scheduled to go on stream in August 1958.

St. Hilaire's associates in the project include Roger F. Dunn, Chicago; Atilla Turkkan, New York; and Dr. A. Cudi Birtek and Nasit N. Fesci, both of Istanbul.

Flow tops 3 million barrels . . .

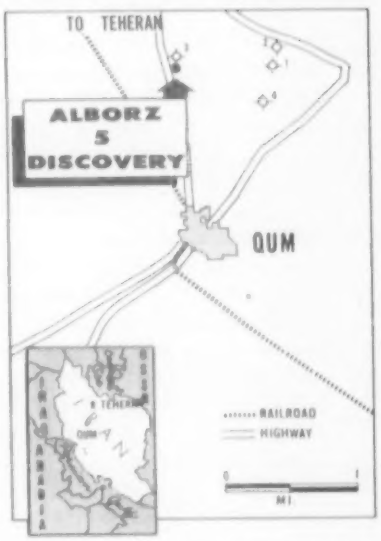
Wild Well to Get Relief Hole

IRAN'S fabulous wildcat flowed more than 3,000,000 bbl. of oil in the first 40 days after it blew in wild, officials of National Iranian Oil Co. estimated last week during preparations for a relief well.

The wildcat, Alborz 5, is in north central Iran's plateau area near Qum. It blew in late in August and is still flowing through a 4-in. line.

Drilling & Exploration Co., which drilled the well, and engineers on loan from other Middle Eastern oil companies are aiding N.I.O.C. in getting the relief well under way.

Alborz 5 has been capped with a head valve, but engineers are afraid to shut the well in until they can get high-pressure equipment installed at the wellhead. They are counting on the relief well to relieve the high pressures enough to get the job done.



Crude being "flared" . . . Crude from Alborz 5 is flowing into open pits hastily thrown up by bulldozers. Most of the crude in sections far enough from the well to prevent igniting the well itself is being burned.

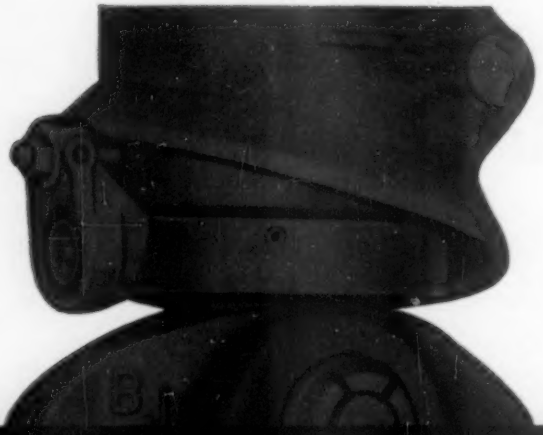
Reports from Iran last week indicated that N.I.O.C. is selling the oil in other sections at 41 cents a barrel f.o.b. the well site. Some of it is being trucked and hauled by tankcar to Teheran where it is bringing 76 cents a barrel as industrial fuel.

The well blew in when the bit broke out of shale and entered a porous limestone formation at 7,800 ft. It threw an estimated 80,000 bbl. of crude daily more than 150 ft. into the air for several weeks.

The head valve was finally applied by Myron Kinley, Houston oil-well firefighter, and engineers from N.I.O.C. and the Iranian consortium companies. The valve, installed by cutting back on the drill pipe, is rated to take pressures of 12,500 psi.

Bottom-hole pressure, however, is believed to be above 10,000 psi. So the operator is not shutting the well in until the relief well takes some of the pressure off and the new equipment is installed.

When you make your derrick man reach out and wrestle the elevator with every stand of pipe, you are wasting drilling time and money . . . and sacrificing safety.



If you don't have a Hook Positioner you're sacrificing Time, Money and Safety!

Here's where Byron Jackson's *exclusive* hook feature pays off. The BJ Hook Positioner automatically rotates the elevator into the correct position for the derrick man. Elevator handles and door are ready for instant, easy latch-on. There's no groping, grabbing and griping.

The BJ positioner consists of a cam follower which travels on a hardened cam track. The cam follower may be set and locked in any of 24 regular positions. Whenever the load is released from the hook, the cam follower travels upward until it contacts the cam surface on the housing. It then automatically travels on the cam surface and rotates the hook body to the predetermined position. This accurately locates the elevator door handles so that the derrick man can quickly, easily and safely latch-on the next stand.

Don't make a monkey out of your derrick man. Make your next hook a BJ Hook with *exclusive hook positioner*. You'll save money . . . with safety!

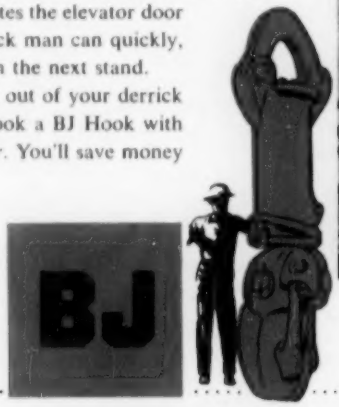
Here's How It Works!

Elevator at monkey board has door handles perfectly positioned for derrick man to load stand.

Going in hole, conditions such as crooked hole, bridges, etc. rotate hook body and elevator.

At rig floor, slips take load and BJ Positioner automatically rotates hook body to pre-set position.

Elevator is fully re-positioned into correct working position—for elevator opening at floor and for instant latch-on at board.



Watch BJ Red for the Newest

Byron Jackson Tools, Inc.

A Subsidiary of Borg-Warner Corporation

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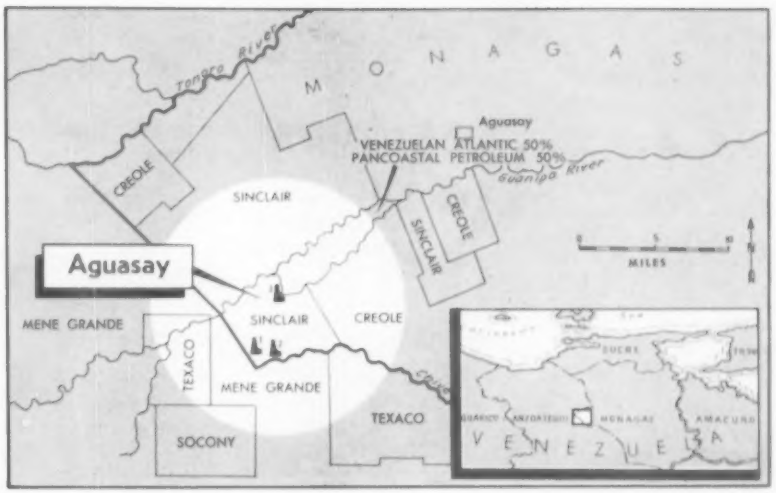


Venezuelan Strike Brighter

EASTERN Venezuela's new oil discovery now promises to be at least twice as good as first reports of the well indicated.

Venezuelan Petroleum Co. (Sinclair) last week completed tests on a second producing section in the well. The second zone has a productive capacity equal to the deeper zone tested first. This would indicate Venezuelan Petroleum's Aguasay 3 is at least a 1,300-bbl. daily well.

Fires activity . . . The discovery is certain to touch off an increase in drilling activity in that area of Western Monagas.

Texas Petroleum Co., Mene Grande Oil Co. (Gulf), Socony Mobil Oil Co., and Creole Petroleum Co. (Jersey Standard) all have concessions in the region surrounding the discovery.

Venezuelan Atlantic Refining Co. and Pancoastal Petroleum Co., C.A., have a 50-50 ownership in a 13,411-acre concession just 100 yards from the discovery well. The two companies contributed to Sinclair's drilling costs and plan to drill an offset on their San Jose de Guanipa concession just as soon as Sinclair completes the well.

The first tests . . . The Sinclair subsidiary tested 689 bbl. daily of 35.1°-gravity oil in its initial tests of Aguasay 3 late in September *(The Oil and Gas Journal, October 1, page 70).*

The well was drilled to a total depth of 14,221 ft. and encountered "a number of potential producing sands." The horizon tested last week was above the first zone tested and revealed a potential as good as the first tests.

Venezuelan Petroleum officials indicated the well will be completed at the conclusion of tests of the first two zones. Other potential sands encountered higher will be tested in later wells.

Latin Labor Contract Signed

MAJOR companies in Venezuela have signed a new 3-year labor contract covering 45,000 workers that will cost $40,000,000 a year.

The heart of the agreement is a 10 per cent wage increase for all workers through middle supervisory brackets. Fringe benefits include housing improvements, travel, and illness allowances, greater severance pay, and longer vacations.

Eleven companies and the National Workers Confederation came to terms October 19 after 2 months of hard bargaining on 90 demands made by workers. The Ministry of Labor served as mediator.

Companies signing the agreement account for all but a small fraction of Venezuelan production, which averaged 2,388,100 bbl. daily the first 8 months of the year.

The companies are Creole Petroleum Corp., Cia. Shell de Venezuela, Mene Grande Oil Co., Socony Mobil Oil Co., Petrolera las Mercedes, Richmond Exploration Co., Texas Petroleum Co., Atlantic Refining Co., Sinclair Oil & Refining Co. (Venezuelan), Phillips Petroleum Co., and Gulf Refining Co.

The new contract runs for 36 months, rather than the 18 asked by the union. The union also failed in other demands. Foremen and supervisors are still classified as management, and the union did not win representation to help rule on promotions, worker classification, or on union hiring.

Before the new contract went into effect, industry wages and benefits cost $250,000,000 a year. The average worker drew $7 daily in direct wages and a total of $20 a day in fringe benefits and indirect wages. Top drillers received a total of $29.50 daily in over-all wages and benefits.

The union and companies were far apart in their early negotiations. Workers demanded a 20 per cent pay increase, full pay for 52 weeks on non-job illnesses, 1½-time pay for home-to-job travel time if work was over 10 minutes away, and 50 times as many scholarships made available to workers and their children.

Grants Continuing

Guatemala concessions are based on compromise pacts

GUATEMALA last week continued to make public awards of oil exploration concessions based on compromise agreements made by the 22 companies and individuals who applied for overlapping concessions in the little Central American country.

A number of concessions have already been disclosed *(The Oil and Gas Journal, July 15, page 79; September 24, page 104; October 1, page 73; October 8, page 129; and October 22, page 88).* Last week Guatemala added the following:

. . . 100,000 acres in the Lake Izabel area to Inversiones Guatemaltecas-Americanas, S. A., a company established by David C. Bintliff, Houston, and Carlos Dorion of Gatemala.

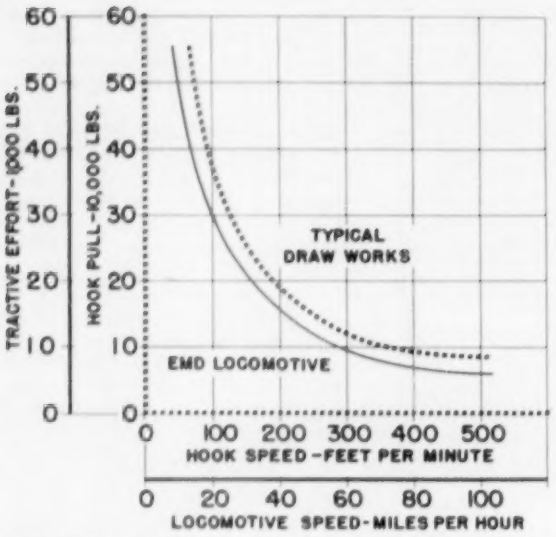
The area in the concession lies between two arms of Lake Izabel. Bintliff indicated in Houston last week that barge-mounted drilling equipment may be used to explore the acreage. Plans call for exploration to start immediately.

. . . 482,789 acres in Peten near the British Honduras border awarded to Petroleum Investments (Overseas), Ltd., a Royal Dutch-Shell subsidiary.

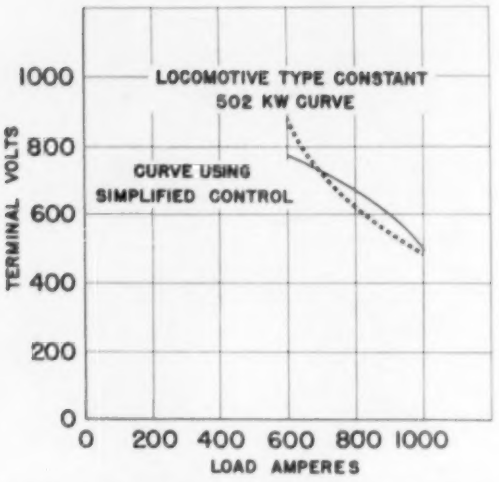
. . . 892,000 acres near San Andres and La Libertad in the Peten to Texas Petroleum Co. (The Texas Co.).

. . . 750,000 acres in northern and eastern Guatemala to Keroc, Inc., Denver. William T. Kerns, president of the firm says tentative plans for a drilling program for early 1957 have been made.

. . . 383,243 acres in central Peten to Sohio Caribbean Co. (Standard Oil Co. of Ohio).



HOOK PULL of draw works has the relationship to speed as does the tractive effort of a locomotive, for which diesel-electric drives are well established. Fig. 1.



GENERATOR LOAD characteristics on draw works service closely approximate the constant-power locomotive type of curve. But the controls are simpler. Fig. 2.

Application of Diesel-Electric Traction To Oil-Well

Locomotive power units produce the same type of pull needed by draw works. Series-wound motors best fit this application as well as the drive for rotary table and mud pumps. Control of generator excitation provides power control of motors.

DIESEL-ELECTRIC drilling-rig power provides flexibility, ease of control, physical separation of prime mover and load, high efficiency and eliminates chain compounding and alignment. With this type of rig, the engine can operate at optimum speed to provide economical power. Electric transmission is an infinitely variable speed changer that matches engine output to load in a smooth, shockfree operation.

Multiple loads can be handled by one engine; mud pumps can be driven at one speed and rotary table at another without elaborate compounding. Engine and load speeds are independent. Power connection may be by a switch or plugged-in cable leads.

Author is chief electrical engineer, Electro-Motive division, General Motors Corp., La Grange, Ill. Paper presented at 1956 A.S.M.E. petroleum mechanical engineering conference, Dallas.

Separation of power source from load permits space savings up to several hundred square feet of expensive deck space in offshore operations and eliminates alignment requirements of land rigs.

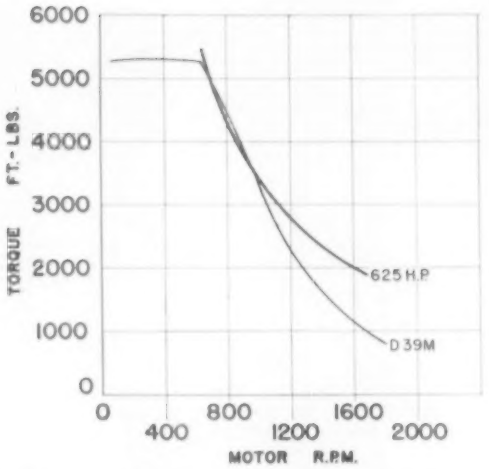
Components . . . Power source in our design is the EMD 567-C diesel engine. At full load it operates at constant speed and constant torque. The draw works requires varying speed and varying torque. This is provided by d.c. series traction motors (D39).

Fig. 1 shows a typical draw-works curve paralleled closely by a typical locomotive speed-tractive effort curve. The draw-works curve has exactly the same shape as our locomotive curve of miles per hour, or speed, against tractive effort, or pull, indicating that the series motor is better suited to the draw-works requirements than any other type of motor.

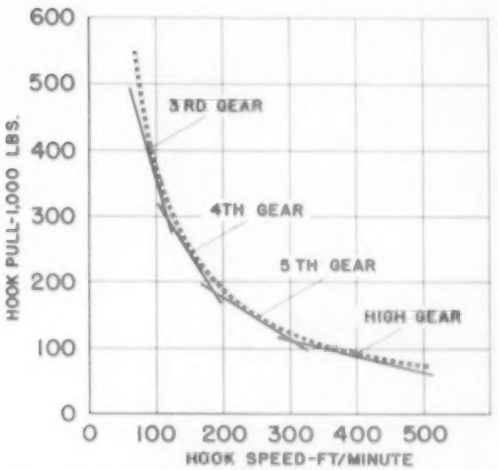
Locomotive drive components on drilling rigs, however, should satisfy the following requirements:

- Over-all system must be as simple as possible.
- Maximum interchangeability of components must be maintained.
- Maximum flexibility must be achieved.
- Equipment should be designed with inherent protection built in to the greatest possible degree.

Starting with the engine, it is necessary to convert mechanical power to electrical power. The engine must be matched with a generator of the exact characteristics required for drilling operations. The large-sized generator used for locomotive power does not offer the degree of flexibility of operation needed for an oil rig. Here we



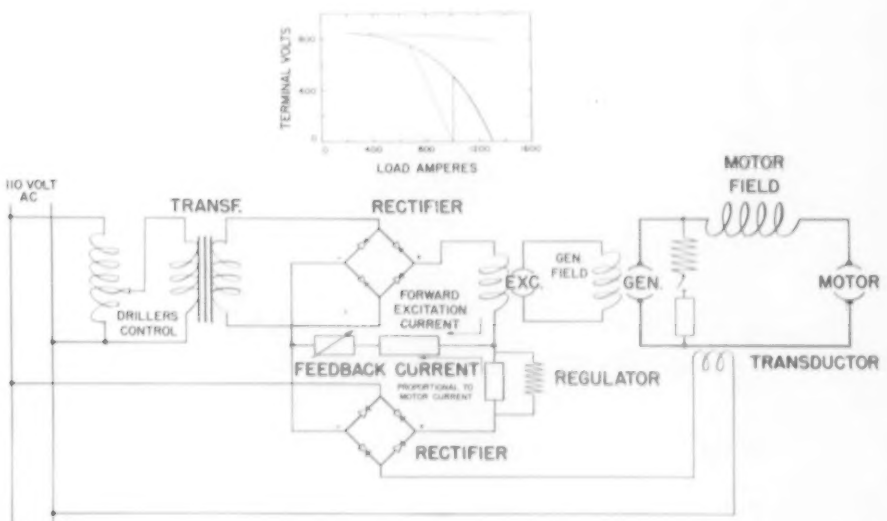
SERIES MOTOR applied to draw works has almost constant power over most of the speed range. Reduction in speed with increasing torque makes it ideal for hoisting loads. Fig. 3.



ELECTRIC TRACTION MOTORS coupled together to produce 1,200 hp. produce this actual draw-works curve. It closely follows the "ideal" draw-works hoisting curve (dotted line). Fig. 4.

Power Drilling

by B. H. Hefner



EXCITATION CONTROL CIRCUIT uses 110-volt a.c. current to regulate generator output and thus motor performance. Small graph at top shows characteristic output. Fig. 5.

have to use a generator that best matches the requirements of the load motors.

Several different designs of generators have been applied and are used in the electrical transmission system of locomotives: (1) Separate excitation with special exciters; (2) separate excitation with differential field; (3) shunt generators with both separate and differential field windings.

However, none of these systems is satisfactory for oil-rig application: (1) The multiplicity of load functions could not be met without serious control complications; (2) the general characteristics would not fit the requirements.

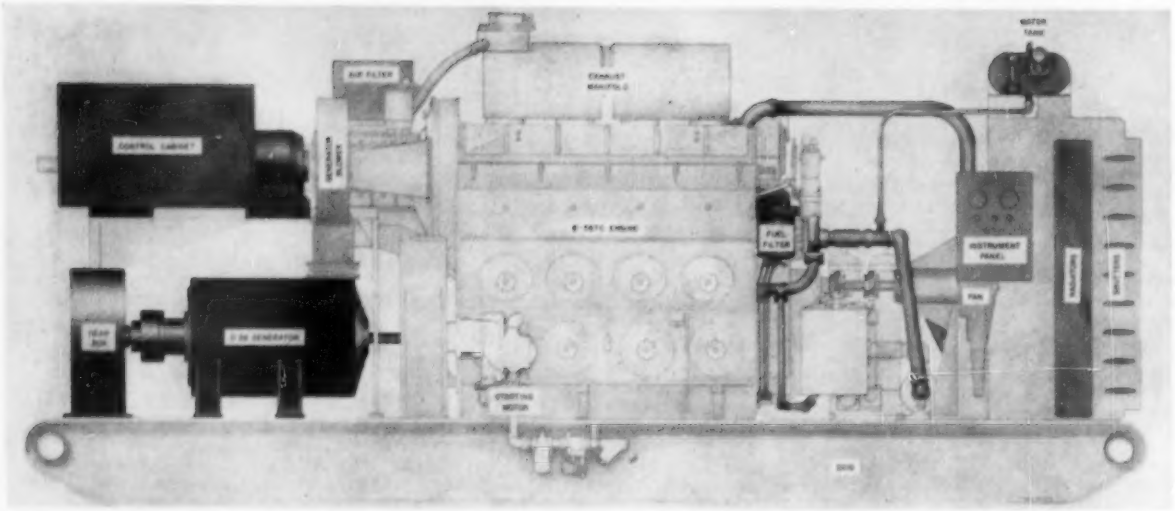
A standard locomotive traction motor, with field windings modified to provide the characteristics needed, most closely matches the requirements of the load motors. This modification of a standard machine, now designated as the D-39 generator, provides a simple separately excited generator that meets, economically, the varied needs of oil-rig operation.

Generator characteristics . . . Fig. 2 shows the D-39 generator-load characteristics for draw works (solid line). This curve was obtained by the use of simplified control. This approximates closely the locomotive-type constant 502-kw. curve (dotted line).

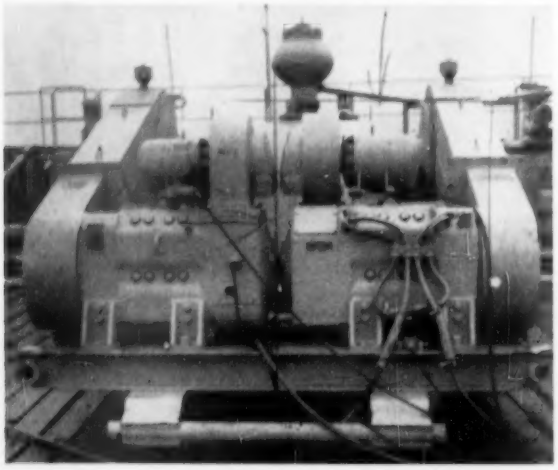
Our locomotive-control system allows us to produce full power over the entire range but it is quite complex and has a slow response. In the interest of simplicity, we designed a system that would provide more power over one part of the range, and slightly less over the other part of the range.

Draw-works motor . . . Fig. 3 shows that the D-39 motor speed-torque curve approximates the shape of a constant power (625 hp.) curve. This reduction in speed with an increase in torque, and vice versa, is characteristic of a d.c. series motor and makes it ideally suited for either locomotive-traction application or for a hoisting type of load.

In applying D-39 motors to the draw works, we get the actual curve shown in Fig. 4 which follows closely the



THIS 875-HP. POWER UNIT consists of eight-cylinder engine driving two 500-kw. D39 generators. Total weight is 53,000 lb. Length is 25 ft.; width is 7 ft. 10 in.; and height is 10 ft. Fig. 6.



D39 MOTOR is series wound d.c. rated at 625 hp. To get matched power between generator and motor the same machine is used as a generator with modified field windings. Fig. 7.

theoretical requirements, and allows extremely smooth, shockfree operation.

On this graph the dotted line indicates the "ideal" curve for draw-works application. The solid lines show the close conformation of the D-39 series motor characteristics to the ideal curve for the four transmission speeds used currently in a standard draw works.

Pump and rotary . . . For mud-pump and rotary-table either a series or shunt type of motor could be used with the D-39 generator. However, the series motor offers several advantages: (1) As the torque demand of the load increases, the motor will slow down somewhat, thereby warning the operator of a change in drilling conditions in the case of rotary table or a change in liner pressure in the case of a mud pump. (2) A separate source of field excitation is not needed. (3) The same control can be switched from one machine to another, permitting very flexible operation and simplified control. (4) Complete interchangeability of components.

On the basis of these several advantages, the series motor is a logical choice for rotary-table and mud-pump applications.

Excitation Control System

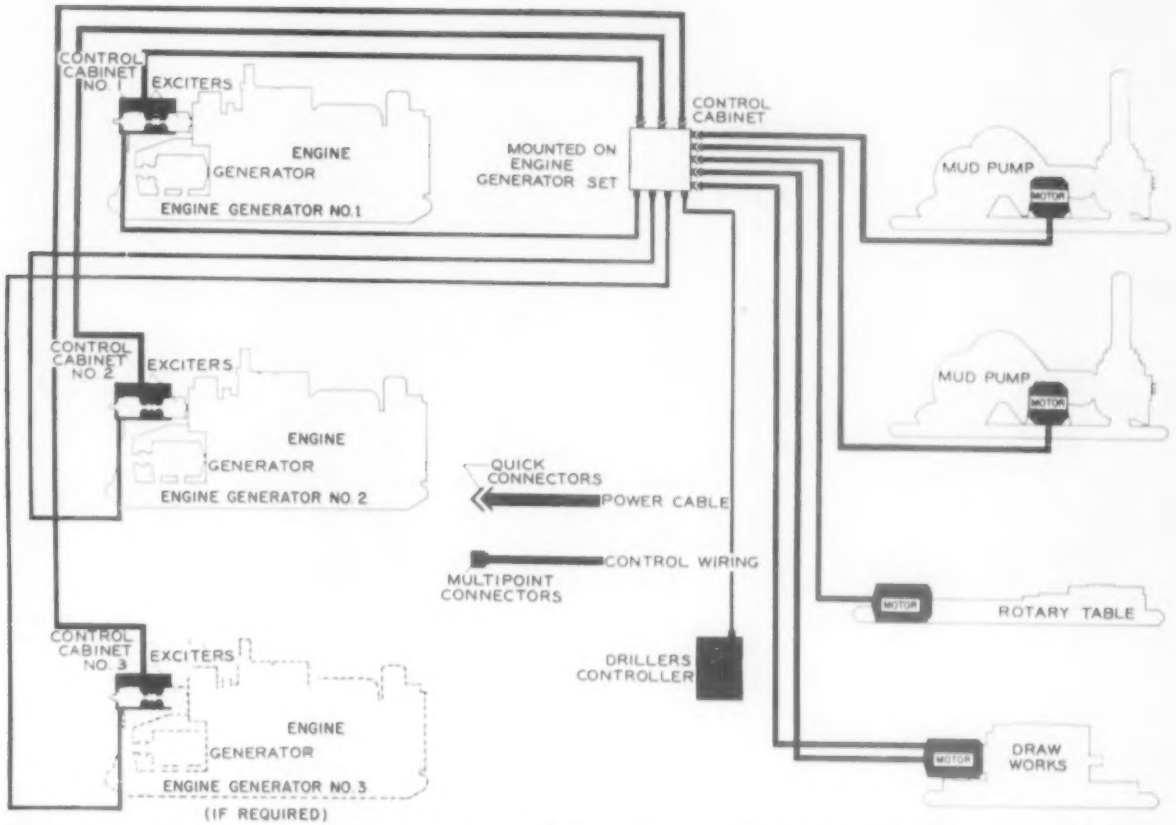
In the design of the control apparatus, simplicity and extremely rugged components requiring a minimum of space are prime considerations. An a.c. power source for this control system and a.c. components for control of generator excitation reduce the size of the equipment required and the initial and maintenance costs. With this type of control scheme very low voltage and current are employed throughout the excitation system.

The circuit diagram shown in Fig. 5 shows how excitation control is achieved in the electrical-transmission system. At the top of Fig. 5 is a plot of generator terminal volts against load amperes. The horizontal broken line (at the top) is the generator characteristic resulting from a given excitation without control. The solid line is a simple characteristic most nearly approaching the constant-power curve desired for drill rig-generator operation. This is obtained with control. The vertical broken line represents the intermittent generator output obtained by control for torque limitation to protect mechanical equipment used on the drilling rig. The diagonal broken line (short dashes) represents the continuous generator output obtained by control to protect the machines from overload damage.

This required generator performance is obtained with the excitation control circuit diagramed. This excitation circuit is identical for each engine-generator set and for each load connected to the generators.

The 110-volt a.c. power supply, which is common to almost every rig in the field, is taken through a variable voltage transformer, which is the driller's hand control. Controlled excitation current flows from this point through a step-down transformer, then through a rectifier and the exciter field. The exciter amplifies the excitation current to the generator field, and the power, controlled by the driller's variac, flows from the generator through the armature and field windings of the load motor.

Feed back . . . The transductor (a type of transformer) is applied in the power



DIESEL-ELECTRIC RIG SYSTEM provides complete flexibility of equipment placement and ease of installation. From the main controller the driller can easily regulate and observe the operation of all equipment. Fig. 8.

circuit between the generator and motor to limit the maximum generator current and to stabilize the control system.

The small direct-current output of the transductor, which provides the equivalent of a differential field, is proportional to generator output and is added to the exciter-field current through a resistor in series with the exciter field; it serves to oppose the forward excitation supplied by the variable-voltage transformer. This is part of our feed-back control.

A regulator is provided in the exciter circuit. One coil of the regulator is shown in the control circuit, the other coil is connected across the generator to motor power circuit. This regulator, through its resistors, is employed for torque limitation. It is adjustable to permit setting of torque limits to fit any given application.

The rectifiers covert a.c. supply to d.c. for the exciter field. With this type of control, low voltage and low current are used providing maximum safety.

This schematic of the excitation-control circuit illustrates the relative simplicity of the control system used, and the few components required to obtain the generator characteristics desired.

Drilling Rig Components

Diesel engine . . . The model 567-C engine shown in Fig. 6 is the prime mover for the drilling rig. This eight-cylinder, two-cycle, V-type diesel engine develops 875 hp. at 835 r.p.m. Continuous torque is 5,500 lb.-ft. These ratings are based on 90° F. air intake and 0 to 2,000-ft. altitude.

Generators . . . The model D-39 generator is identical with D-39 motors except for the main field windings which are modified to provide the characteristics desired. Two of these a.c., 502-kw. generators are mounted on the skid with the engine and are rotated by the engine crackshaft through a gear box.

Motors . . . Model D-39, series-type, d.c. motors (Fig. 7) are rated conservatively at 625 hp. These motors are insulated for Class H operation and are equipped with sealed, grease-lubricated roller bearings and a perpendicular brush arrangement permitting rotation in either direction. Alternating-current, motor-driven blowers, mounted on the motors, provide cooling air. All parts except main field windings are interchangeable with D-39 generators.

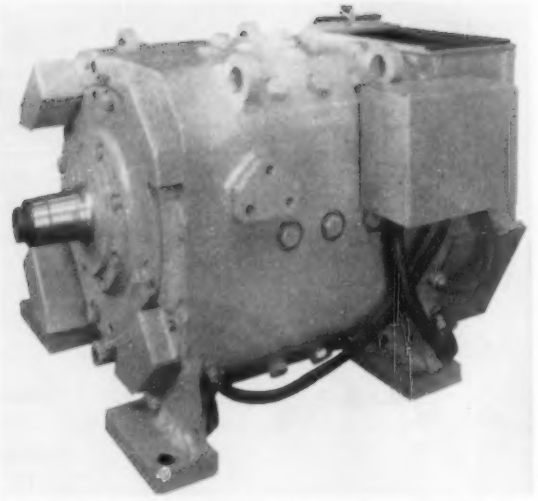
These motors are mounted singly or in pairs on a steel base and geared to a shaft from which power may be transmitted to a draw works or to mud pumps. Power for the rotary table may be supplied by the draw-works motors or by a separate D-39 motor.

Control apparatus . . . The control system as outlined in schematic form in Fig. 8 is designed specifically for this diesel-electric equipment and to provide the performance desired. It employs easy-to-operate and easy-to-maintain components, largely of the static type, which are the result of years of development work and field experience with the complex control systems of diesel-electric locomotives.

Connection or reconnection of a generator to load is simple and fast through use of flexible power cables and quick connectors. An individual generator is used with each load motor, providing maximum reliability since operation of each generator affects only one motor.

The skid-mounted control cabinet features small size and maximum accessibility. High interchangeability of parts is achieved. Multipoint connectors used in the control wiring system provide flexibility and facilitate hookup of circuits between the control cabinets and the driller's control stand.

OFFSHORE DRILLING RIG, as sketched here, finds the flexibility and compactness of electric drives important in conserving valuable space. Fig. 1.



D.C. TRACTION MOTOR provides reliable drive for draw works, pumps, and rotary. It is modified to a shunt field winding rather than a series winding. Fig. 2.

A New Approach to Electrification Of Oil-Well Drilling Rigs

by F. A. Compton
and C. D. Neithamer

Modified, transportation type of electric motors, generators, and control on drilling rigs can increase efficiency. This standardized, mass-produced equipment keeps initial costs low. Advantages of electric drive for drill rigs are: greater flexibility and smooth power application, reliability, easy maintenance, possibility of remote location, easy rig-up and tear-down, and efficiency.

ELECTRICITY for drilling power is not new. The first electrically operated well was drilled with cable tools in 1909. In 1915, variable-speed induction motors were first used on a rotary drilling rig. In 1929 the first d.c.-powered rotary rig was put into service. This system used engine-generator or motor-generator sets to provide direct current to the various rig loads.

Most of the electric rigs built are still in service and are doing a creditable job. They have proved reliable, required little maintenance, are portable, produce less engine wear, and because of the flexibility, there is less down time.

The main reason drilling rigs were not electrified more rapidly is high initial cost of the equipment. The equipment used was produced in low volume and electrification of a rig included high content of engineering. Obviously, these factors made the price high. As a result, over the years only a few electric rigs were sold.

Transportation type of equipment . . . Today, a new approach to drilling-rig electrification is use of standardized, transportation type of equipment. These d.c. motors, generators, and control were developed and mass produced for thousands of diesel-electric locomotives. This equipment offers advantages never available before.

The power needs of a drill rig are quite similar to those of a locomotive since it requires variable speed, variable torque, and variable horsepower. Also, like a locomotive, a drill rig requires motors, generators, and control that are lightweight, compact, and extremely rugged. Mass production of these components makes a low-cost, electric-drive package for drill-rig service. Present prices are one-half those of the individually designed earlier equipment. Control has been simplified to make it as foolproof as possible.

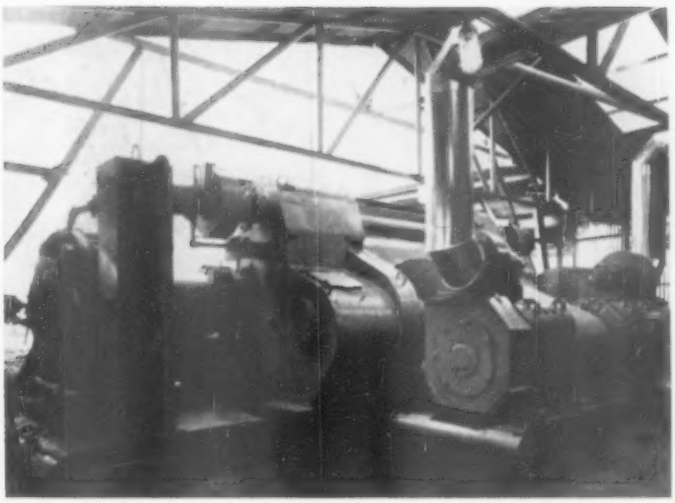
This new approach is coupled with growth of offshore drilling where electric transmission is a natural. In the past year and a half, more diesel-electric or gas-electric rigs have been sold than during the entire previous history of electric rigs.

A highly portable land rig using this electric equipment has been purchased. This installation may open a new concept of rigs and prove the economies of electric drive for land drilling.

Advantages of Electric Drive

Some advantages electric drive offers are:

Authors are manager of engineering and sales engineer, respectively, locomotive and car equipment department, General Electric Co., Erie, Pa. Paper presented at 1956 A.S.M.E. Petroleum Mechanical Engineering Conference, Dallas.



DRAW-WORKS DRIVE here is two d.c. motors. Ducts are for motor ventilation. Fig. 3.

875-HP. GENERATOR has auxiliary generators for field excitation. Fig. 4.

1. **Speed.** Holes are drilled faster because of greater flexibility and smooth power application resulting in less down time. Should an engine fail, the remaining power units can be assigned to drilling loads without delay.

2. **Reliability.** Electric rigs have demonstrated that the reliability of electric equipment is almost 100 per cent. Furthermore, the particular electric components offered for drilling rigs have been thoroughly proved in locomotive service.

3. **Standardization.** Lowest possible first cost is obtained by maximum use of standard transportation type of components.

4. **Easy maintenance.** Electric equipment includes very few wearing parts, basically, only brush and contact tips. Therefore, maintenance expense is reduced to a minimum. Motor bearings are antifriction, grease-lubricated, and sealed. Relubrication is estimated on a 3-year interval. Much of the mechanical-drive equipment such as belts, chains, sprockets, clutches, and torque converters is eliminated; this helps to reduce over-all maintenance cost. Alignment problems are eliminated because permanent connection of the motor to a rig load is possible.

5. **Remote location possible.** Electric drive permits location of the power units away from the hole, thus reducing the fire hazard. Also, by removing the noise and vibration from the drilling platform, fatigue is lessened.

6. **Portability.** The diesel-electric or gas-electric components are connected by cable, allowing easy arrangement in convenient packages. Setup is simplified since there are no alignment problems in connecting cables. This results in less rigup and teardown time.

7. **Reduced weight.** Massive substructures are not required with electric rigs. This helps to reduce the loads at moving time and allows them to be more easily made into packages of legal size for the highways.

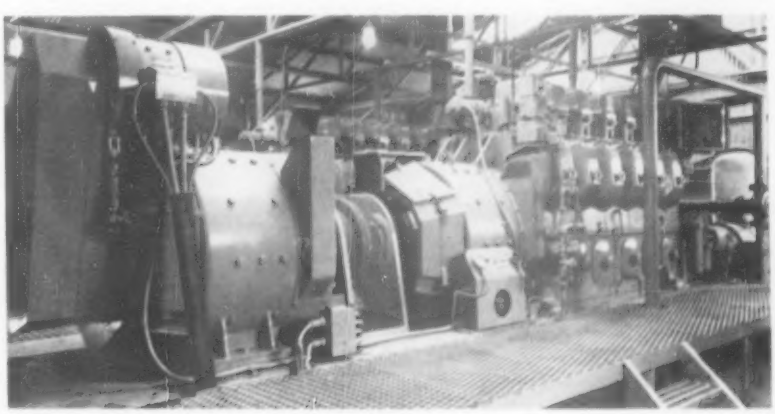
8. **Smooth operation.** Smooth application of controlled torque to a particular load is provided by electric drive; thus shock loads are eliminated, resulting in longer life and less upkeep.

9. **Efficient.** Transmission losses are low, so the efficiency of the electric-drive system is approximately 85 per cent to which a minimum of chain loss is added. Draw-works-drive ratios may be reduced for greater efficiency.

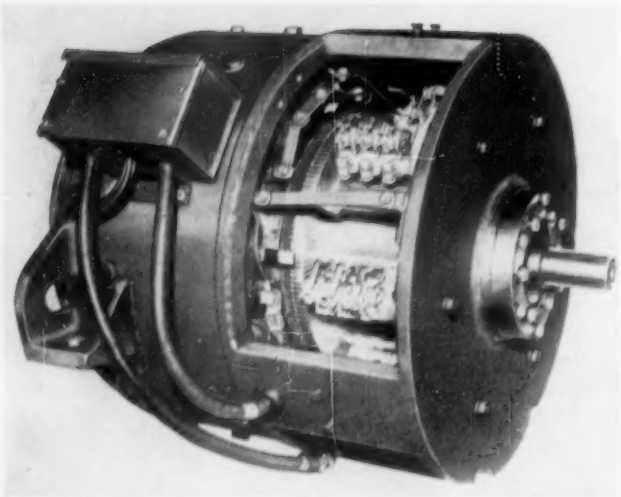
10. **Compact size.** Small size of electric components permits more effective utilization of valuable platform area.

Electric equipment lends itself readily to accurate study of rig performance. Exact values of torque, speed, or power can be obtained and streamlined rigs may very well result through analysis of this information.

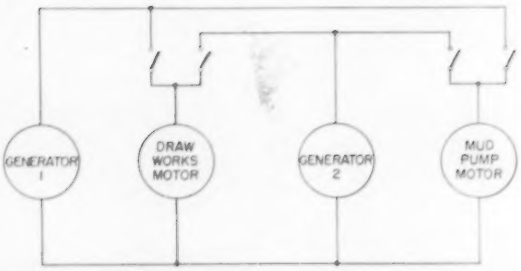
Shunt motors . . . Fig. 2 is the d.c. traction motor. Thousands of these motors have operated for years on U. S. railroads and have proved reliable. On even smaller rig loads it is advantageous because of its low cost and interchangeability. The motor rates 600 hp. at 900 r.p.m. continuously, and 800 hp. at 900 r.p.m. intermittently for hoisting. Electrically, it is the same as the railroad motor with the exception of the field, which has been changed from a series to a shunt wind-



POWER UNIT here is two transportation-type generators driven by six-cyclinder engine. Fig. 5.



CLOSE-COUPLED GENERATOR provides 260 hp. at 1,800 r.p.m. It has three-field construction. Fig. 6.



POWER CONNECTION of this type allows either generator to operate either motor. Fig. 7.

ing. Fig. 3 shows two d.c. drilling motors connected to a draw works.

Close control of motor speed and torque is necessary at all times on a rig. The shunt motor together with the inherent generator characteristics provides continuous smooth power application, under the control of the driller at all times without complication.

Series motors exert high torque when approaching a stall. Also, under no load, the motor speeds up with the danger that it may destroy itself. Control devices are required to limit both torque and speed with a series motor. These devices, and the additional circuitry required add complication.

The modified traction motor has been made splashproof; has sealed, grease-lubricated bearings; high-temperature insulation; includes a terminal box for convenience in attaching electric cables; and has feet so that it can be mounted readily. Moreover, it has a surface for registering the chain case and a surface for the felt seal between the chain case and the motor. A top-mounted offset blower for ventilation requires only 2 hp., easily handled by the auxiliary power system.

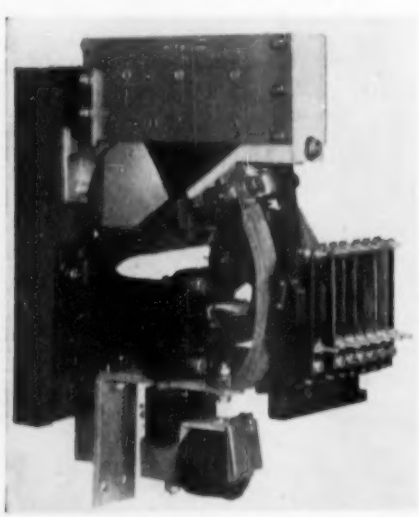
Complete interchangeability of the motors on the rig is possible because each motor is furnished with a standard hub to which a sprocket is bolted. The sprockets can vary from drive to drive as required.

Generators . . . The generators are designed so that the desired characteristics are built in. For instance, a differential field winding provides inherent current protection for the system.

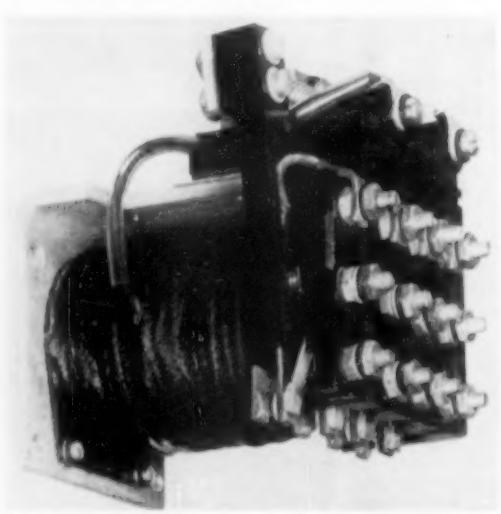
There are three types of generators for use of rigs. One is rated 875 hp. at 1,000 r.p.m. and is either a single-bearing machine or a two-bearing machine. Fig. 4 shows the two-bearing machine with two belt-driven auxiliary machines, one an auxiliary generator for motor field excitation, control power, and motor blower power, and the other the exciter, for generator field excitation. This generator is weatherproof and includes a terminal box for easy access to the generator leads. Fig. 5 shows two generators of the transportation type connected to a six-cylinder engine.

The second generator is a universal type and is a modification of the type of motor described before. It rates 600 hp. over a speed range of 1,000 to 1,200 r.p.m. and can be operated with a number of standard oil-field engines. This generator helps to keep the interchangeability of parts at a maximum between motor and generator. In order that this machine can be used where two generators per engine are required, it is available with either a single or double-shaft extension. Electrically there is no difference. A shunt field and a separately excited field provide basic output of the generator.

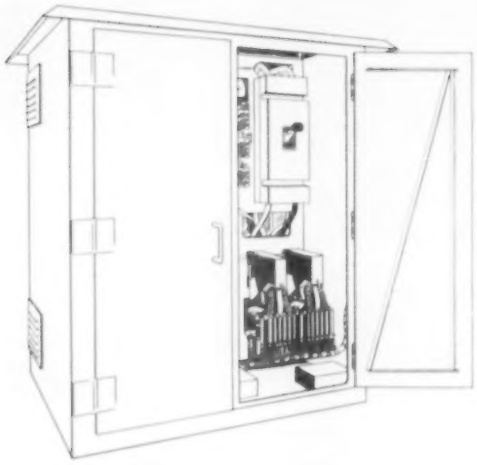
Third generator is a close-coupled unit and rates 260 hp. at 1,800 r.p.m. Fig. 6. This generator also has a three-field construction. It is a self-ventilated machine and has been weatherproofed.



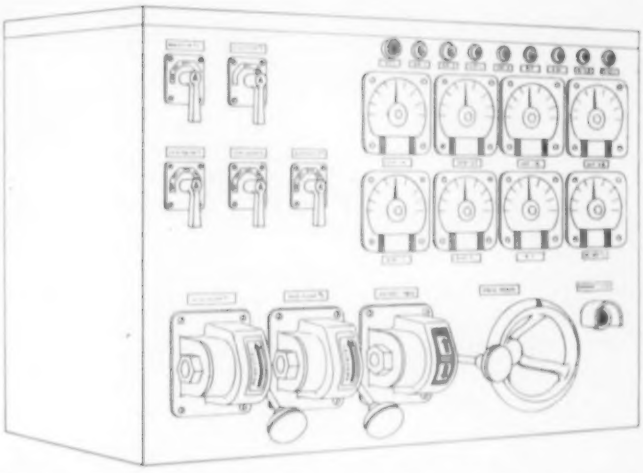
CONTRACTOR for controls is air operated. Fig. 8.



RELAY used in controls is standard equipment. Fig. 9.



CONTROL BOX houses contactors, relays, resistors, rheostats, solenoids, air valves and is weatherproof. Fig. 10.



DRILLERS PANEL provides control of generators and motors by simple switches. Dials show all motor loads. Fig. 11.

With this generator, multiple groups of smaller high-speed engines can be used to power the rig. By paralleling the generators into a motor, up to its rating, flexibility of power can be achieved. Moreover, larger offshore installations have been considering these smaller high-speed engines.

Motor regulation . . . A shunt motor which has a constant field excitation permits speed and torque variation by changing generator output. This can be done (1) by engine-throttle control, or (2) by generator-field control. When two generators per engine are used, independent control of generator output is obtained by field control. Engine speed is preset at one of two or three available speed settings and will not vary.

When one generator per engine is used, varying engine speed will control generator output.

Electrically, either system gets the desired result; choice depends on size of engine selected.

The typical power-connection diagram for either system in Fig. 7 is simplified to show only the power circuits for a portion of the rig. This arrangement permits either generator to be connected to either motor. Additional loads would use similar circuits.

Control . . . Much of the control is built into the generators and motors. This means that simple contactors and relays can be used. The standard locomotive contactor used is shown in Fig. 8. Air operates the contactor itself. The contactor receives a signal from a low-voltage control wire which in turn opens and closes an air valve which operates the contactor.

Fig. 9 shows a typical relay.

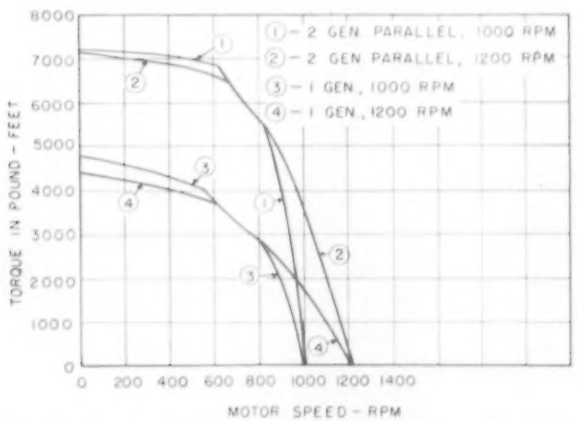
The remainder of the control consists of resistors, rheostats, solenoids, and air valves.

Main control compartment is weatherproof and can be pressurized. A typical compartment is shown in Fig. 10. A typical driller's panel is shown in Fig. 11. The instruments on the panel tell the driller at all time exactly what is occurring on any load.

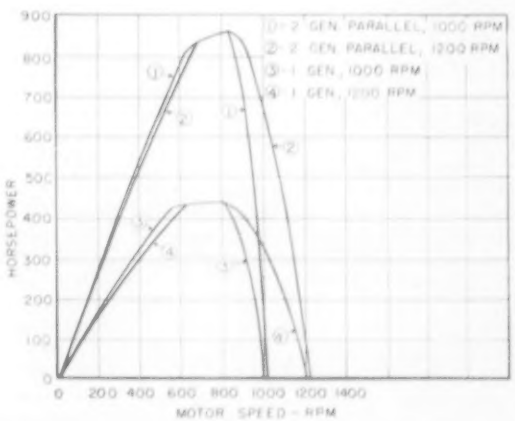
Performance characteristics . . . Fig. 12 is a torque-versus-speed-performance curve showing the motor powered by either one or two universal generators. Varying engine speed or generator excitation will produce an infinite number of curves from zero torque to full torque. This illustrates the complete flexibility of torque control.

Fig. 13 is a horsepower-versus-speed-performance curve of the same equipment. As in the torque-versus-speed curve, by varying the engine speed or by varying generator excitation an infinite number of horsepower curves will be available.

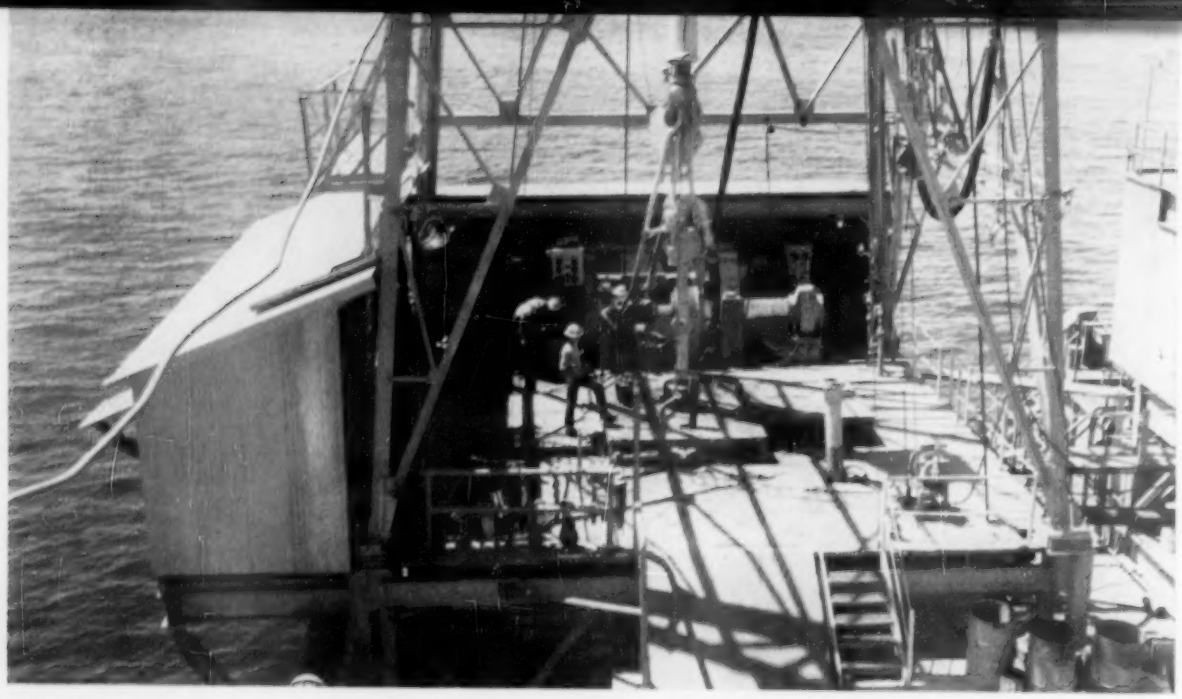
These two curves are the same for both constant and variable engine speed.



MOTOR TORQUE is high at no load but drops to zero at top speed. Varying engine speed or generator excitation allows wide range of torque. Fig. 12.



MAXIMUM HORSEPOWER of motors occurs at speeds slightly more than half the generator speeds. These curves are for shunt-wound traction motor. Fig. 13.



Object: To design a large rig for a small area for offshore drilling. Result . . .

Railway Equipment Performs for Phillips

Here is how diesel-electric power was put to use in the design of a rig layout for an offshore platform. Derrick and draw works are skidded from well to well—a cheaper system than a multiple-well derrick using a movable crown block and rotary. Some troubles occurred but future looks good.

by H. D. Redding

IN 1955 Phillips Petroleum Co. decided to drill off the coast of Louisiana in 85 ft. of water. A self-contained platform was to be used and to cut costs by keeping the floor area to a minimum the platform designed was only 140 by 85 ft. with an area of 85 by 58 ft. allotted for the rig.

Objective was to design a rig arrangement that would allow a large rig to be placed in a small area, would allow drilling of six wells, and which could be moved in a short time.

To accomplish this, we bought a diesel-electric rig using traction equipment and put it together in three large packages. Each package is light enough that it can be handled with existing derrick barges.

Derrick . . . The 140-ft. conventional derrick and four-post, girder-type derrick substructure is one package. It contains all the normal floor and derrick equipment and draw works, rotary table, and their motors and blowers. This package stands unattached over the hole to be drilled. It is connected to the rest of the rig by only a mud line, flow line, and electrical cable.

Power package . . . Second package contains the mud pumps, the d.c. and a.c. generating equipment, air compressors, a.c. generator control and power distribution panels, d.c. motor-control box, electric-logging unit, welding machine, and day fuel tanks. It takes up only a 30 by 30 by 30-ft. space on the platform and is three stories high. It is placed on the back of the rig area as far from the derrick package as possible. However, this only amounts to 16 ft. on two farthest wells and 1 ft. on the two closest wells.

Mud-tank package . . . Third package contains the mud tanks, shale shaker, pump suctions and valves, mud centrifuge, propeller mixers, chemical mixing tank, and the parts house. It covers a floor area of 31 by 17½ ft.

The mud-tank package is placed on the back of the rig as far from the hole as possible and alongside the power package.

Author is assistant division rig superintendent, Phillips Petroleum Co., Houston. Paper presented at A.S.M.E. Petroleum Mechanical Engineering Conference, Dallas.

DRILLING

Derrick

To move the derrick package with a derrick barge, the derrick has to be torn down to the fifth girt. This is because the platform is so high above the water that the derrick cannot reach any higher than the fifth girt and pick up a weight of this size. With the top of the derrick stacked on the floor, the derrick package weighs 125 tons.

The substructure for the draw works and motors moves with the derrick substructure. It extends 10½ ft. out the back of the derrick and is knee-braced to the bottom of the substructure. The extension gives plenty of room where it is needed but does not require any extra skid beams in the deck to support it.

The derrick is turned so that the V-door faces the pipe rack and is in its normal position, across from the draw works. The pipe rack runs across the short dimension of the platform and runs alongside the power package and

the derrick. The derrick had to be turned 90° from the power package so that the draw-works support could extend out over the edge of the platform instead of into the power package.

Power Package

The power package consists of a 30 by 30-ft. grillage on which two 700-hp. pumps are placed with the mud end facing directly toward the mud pits. On this grillage are two 30 by 30-ft., four-post engine substructures, one on top of the other. The top of each of these had been floored and extended 5 ft. on the three sides away from the derrick for added room. They provide two additional levels with an area of 40 by 35 ft.

On the top of the first substructure are two d.c. generating units, three 125-hp. a.c. light plants, two 15-hp. air compressors and motors, the d.c. motor-control cabinet, the welding machine, and the a.c. generator control and power-distribution panels. On the top of the second substructure are the electric logging unit, the day fuel tank and the fog-horn compressor. The generator deck is completely housed to protect it from the weather and provide some kind of wall between possible gas from the hole and the generators.

This package can be picked up in one piece. It weighs 225 tons.

Mud Tank

The last package has a mud tank 31 by 17½ by 8 ft. with a partition down the middle separating it into two equal-sized, almost square tanks. In it are the pump suctions and valves, propeller mixers, dual shale shakers, the mud centrifuge, and the chemical tanks. Above it on the same level as the generator room of the power package, is the parts house. Also on the mud-tank package are the steps leading from the second level of the power package to the top level. This whole mud package weighs 65 tons and can be picked up in one piece.

Skidding the rig is relatively easy because only the derrick package has to be moved.

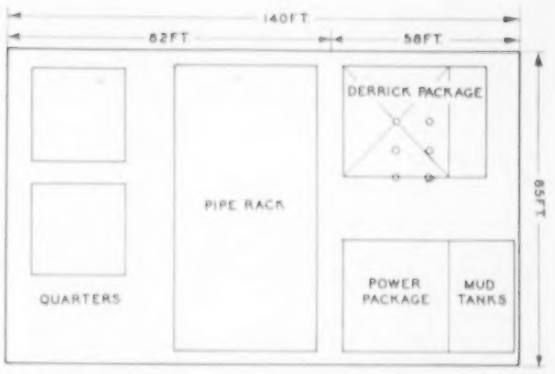
Advantages of Arrangement

We originally thought of using a conventional power rig with a conventional derrick and pumps under the engines. However, the entire rig has to be skidded from well to well. Our alternative was the conventional power rig with a six-well derrick. This would have allowed us to leave the rig where it was for all the wells and merely move the rotary and the crown block. However, the six-well derrick was discarded because of its high cost.

The disadvantages of the straight power rig led us to consider a diesel-electric rig.

The advantages of the diesel-electric rig that allowed us to rig up as we did are:

Diesel-electric power allows flexibility of placement of rig components. No alignment between the generators and the motors is necessary. The allowable distance between the two is governed by the voltage drop through the cable, and within 200 to 300 ft., the voltage drop is negligible. In addition, skidding the rig is very easy because the power cables do not even need to be disconnected.



ARRANGEMENT OF EQUIPMENT on drilling platform allows easy movement of derrick package for multiple wells. Power equipment remains stationary in three-deck structure.

Equipment is smaller, lighter, and more compact than the conventional power equipment. The comparatively small size of the electric motors makes it possible to mount the motor directly on the skid of the piece of equipment to be driven. In some cases a direct drive can be used, in the others a short chain drive is possible. Since the motor is on the skid, alignment and tightness are not problems. Unitization such as this makes rigup and teardown simple because there are no chains to make or break and nothing to realign.

Electrical power is more flexible than straight diesel power. The high starting torque and the speed control of the d.c. motor allowed us to make a jaw-tooth steam draw works instead of the more complex friction-clutch draw works. In addition the rotary table is directly connected to a single motor. Torque-limit controls allow the operator to set the maximum torque on the motor to protect any size drill pipe in the hole.

Diesel-Electric

When we decided to use a diesel-electric rig we had two courses open to us, either to use war-surplus equipment or new lightweight traction equipment.

The pricipal advantage of the war-surplus equipment is its low cost. However, the generators and motors are large and bulky which makes them hard to unitize on a pump or draw-works skid. In addition, the fact that the control system has to be designed and built by the user is a drawback to companies who are unfamiliar with electric engineering problems and do not have any electrical engineers.

Railway equipment . . . The advantages of equipment are numerous:

1. Mass production of engines, generators, and motors for use in the railroad industry have brought the price down until it is competitive with a conventional power rig of the same capacity.

2. Motors and generators are small and light.

3. Equipment is new and has the latest improvements in design and materials. Being new a warranty is provided to protect the user against defects.

4. Control systems are designed, furnished, installed, and serviced by the manufacturer.

5. Parts and replacements are readily available.

6. It is possible to purchase all the diesel-electric equipment from the same manufacturer, or if desired, electrical equipment can be purchased from one concern and installed with any engine that is preferred by the user.

Drive motors . . . Our rig has two 700-hp. pumps. Each pump has one 626-hp. electric motor mounted on the skid driving the pump through a chain drive. The rotary table has an electric motor directly connected to it and both are mounted on a common skid.

The draw works is an ordinary steam type driven by two electric motors. The motors are mounted on a skid that is bolted directly to the draw-works skid but has to be removed whenever the draw works is moved. Later draw works have been made with the motors permanently mounted on the draw-works skid. This seems to be the ideal arrangement as it eliminates any alignment of chains during rigup operations.

The only concession that we have made to diesel-electric equipment in so far as the draw works is concerned, is to provide an inertia brake. This is to stop the draw works when it is coasting, to stop the cathead in emergencies, or to provide a drag on the

jackshaft to help kick out the clutches. Since installing the inertia brake, we have found that it is unnecessary because we do not have any trouble getting the clutches out and the motors may be reversed to stop the draw works in emergencies.

Operational Experience

When this rig was placed in operation, it was the first time that the traction equipment and controls were used on a rig equipped with a steam draw works and a direct rotary drive. A rig rigged up in this manner calls for good speed control and presents more problems of making and breaking contacts under load than a rig using a power draw works and a chain drive to the rotary.

We have had no trouble whatsoever with speed or torque control on the motors. We never have had any trouble getting the motors to operate slowly enough to get the jaw clutches in or operate the catheads at a safe speed. We have had good control of the torque and speed applied to the rotary table.

The troubles that were encountered were almost entirely due to arcing of contactors when the motor circuits were made and broken under load. To eliminate our problems, the manufacturer has tried many different remedies. Some of them have not been successful, others have. Since we obtained the rig, the electrical equipment has been in constant development.

Heavy loads . . . The troubles we have had with the draw-works contactors occurred whenever we stopped the motors after lifting a heavy load with the draw works. Upon shutting off the power, two contactors on the motor circuit would open. Heavy arcing would occur because, due to the heavy load, the motors were pulling high current and this current did not have time to dissipate before the contacts opened. This arcing caused the contacts to burn away rapidly and give very poor service. However, after experimentation, the problem was overcome.

In the draw-works motor circuits there are four contacts, two forward and two reverse. Originally, to run the motors forward, the forward contacts were closed and the reverse contacts were left open and vice versa for reverse. To counteract the arcing, the controls have been changed so that all four contacts stay closed when the motor is in the off position. To run the draw works forward, the reverse contacts were opened, leaving the forward contact closed. Then to shut the motor down, the reverse contacts were closed which would short out the field and stop the motor. However, this had a braking effect on the motor and a 1½-second time delay was added to counteract it.

Underreaming . . . The other major trouble was encountered when we were underreaming. The bit would hang up, then the driller would shut off the throttle control and the pipe and motor would spin backwards. To stop it, he would then put the power back on the motor, but in the meantime the contacts had opened.

In closing the contacts again with the motor in reverse, arcing would result and the contact would not last very long. To remedy this, a 12-second time delay was placed in the circuit so that the contacts would stay engaged for 12 seconds after the power was shut off. This allowed the driller to catch the pipe with the motor, if he so desired, because the contacts would not have opened by the time the power was reapplied.

However, we have changed our method of operation to eliminate the whole problem. Whenever the rotary table stalls we now leave the power on and pick up the pipe, allowing it to spin free. Then we slack off and continue. In addition we plan to install an air-operated brake on the rotary table.

Speed limit . . . We have had some trouble with the speed-limit interlocks on the motors because they are not making good contact due to the vibration. The manufacturer is in the process of developing a new type of interlock.

Our a.c. controls on the d.c. generators have not given any trouble to speak of. The autotransformers that govern the speed of the motors have been replaced with a new, more reliable type. Other control troubles have been traced to loose wires and poor contacts but we feel that this is a normal situation.

We can truthfully say that we have never been completely shut down due to failure of the traction equipment or the controls.

A.c. power . . . The weak link in the entire diesel-electric rig is the a.c. power supply. If for any reason it shuts down, the d.c. equipment becomes inoperative because the control system is a.c. In effect the whole operation is hanging on a chain whose weakest link is the a.c. light plant. To make this system much more foolproof, the d.c. equipment should have an a.c. generator that operates from the main-generator engines. This would make the entire system self-sufficient and eliminate its dependence on an outside source of a.c. power.

Need fresh air . . . Another disadvantageous characteristic of this traction equipment is that the motors and generators need cooling air. It is not the need for a motor and a blower that is a disadvantage but because it is such a problem to provide a supply of gas-free air if the well is making gas.

On our rig we have a 20-in. suction line running from the blowers on the flood out to the other side of the pipe rack. The pump and the generator blowers get their air from inside the generator room.

We have blower fans on all our engines in the generator room so that with the engines running air is discharged from the generator room which in turn draws air in through doors and windows. In case of gas on the rig floor, we plan to open windows in the generator room on the windward side and allow the fans to suck gas-free air into the generator room. This leaves much to be desired but we believe that it is workable.

An improvement should be made in the method of cooling the electrical equipment to enable the user to have a safer rig.

Future Possibilities

From our experience with a diesel-electric rig using traction equipment, we feel that the future will show more and more application for this type.

Unitization of motors and equipment no doubt will make for compactness and unnecessary portions will be eliminated. I am sure that competition among manufacturers of the electrical equipment will result in improved motors, generators, and controls.

Land rigs . . . I believe that the diesel-electric traction equipment will have as big a use on land rigs as it is beginning to show offshore. The fact that motors can be unitized on pumps, draw works, and rotary table will enable a land rig to be rigged up and torn down in a very short time. The draw works and motors can be put on a knee-braced derrick-structure extension, which will eliminate the engine substructures that are used now.

The pumps need not be lined up carefully. The only units that have to be connected to them are the mud and discharge lines. Vibrator hoses could be used on the mud lines and the suctions could be run over the top of the tanks.

In addition, the d.c. generating units can be placed anywhere so long as the cables will reach. It is possible that they could be rigged up on trailers for easy movement. Other allied equipment, such as control boxes and a.c. power plants, could be unitized in as large packages as possible for easy movement. A rig developed in this manner would have fewer truck loads to move and might possibly be lighter.

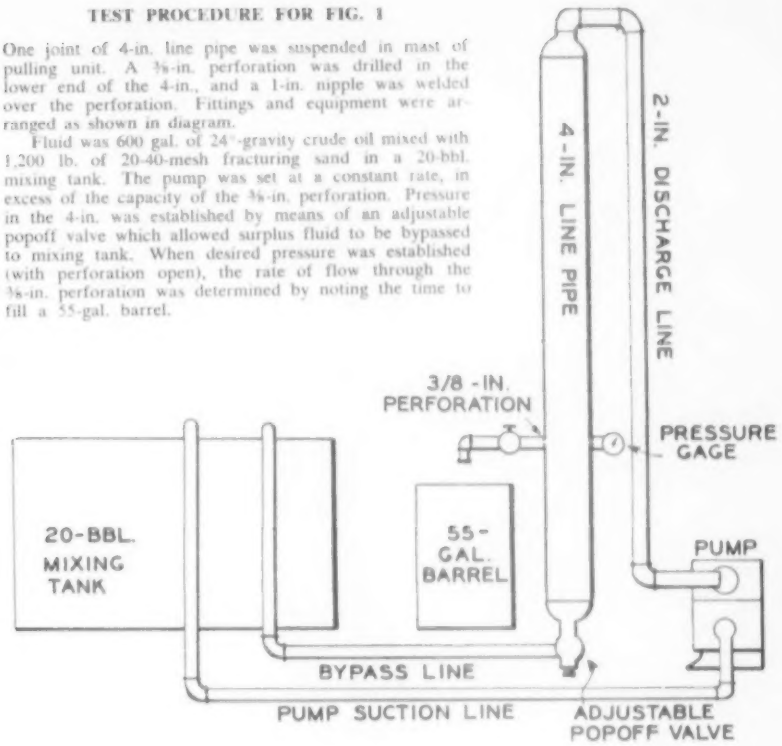
New light on

Fracturing Through Perforations

TEST PROCEDURE FOR FIG. 1

One joint of 4-in. line pipe was suspended in mast of pulling unit. A ⅜-in. perforation was drilled in the lower end of the 4-in., and a 1-in. nipple was welded over the perforation. Fittings and equipment were arranged as shown in diagram.

Fluid was 600 gal. of 24°-gravity crude oil mixed with 1,200 lb. of 20-40-mesh fracturing sand in a 20-bbl. mixing tank. The pump was set at a constant rate, in excess of the capacity of the ⅜-in. perforation. Pressure in the 4-in. was established by means of an adjustable popoff valve which allowed surplus fluid to be bypassed to mixing tank. When desired pressure was established (with perforation open), the rate of flow through the ⅜-in. perforation was determined by noting the time to fill a 55-gal. barrel.



Hydraulic fracturing through perforations is much different from fracturing in open hole. Perforations act as a number of pressure-relief valves, each set to open at a different pressure. Only a few of the perforations that will fracture at the lowest pressures may take all the fluid injected, leaving the rest unaffected. This makes rate of injection a very important variable in fracturing.

by Marion H. Stekoll

THE capacity of perforations to take a sand-oil mixture appears to have an important bearing on the result of hydraulic-fracturing jobs. Field tests indicate that individual perforations will take a sizable amount of fluid at usual pressure levels and that induced fractures may extend from only a few perforations regardless of the number present.

These results suggest that for some purposes, such as opening up several separate pay zones or obtaining several fractures, too many perforations may prevent desired results. They also show that rate of injecting fracturing fluid determines to a large extent how many perforations are fractured or are connected to a fracture.

If the capacity of a ⅜-in. hole (in this discussion, ⅜-in. will mean the size of the standard jet shot) is about 1.3 bbl. per minute, then a pumping rate of 13 bbl. per minute might affect only 10 perforations. Any extra perforations over the 10 that are taking the 13 bbl. per minute may be unaffected by the fracturing fluids.

Where fluid goes . . . As pressure is applied to the perforations in the fracturing operation, it builds up until one or several perforations form fractures into the formation. Then there is a rapid passage of fluid through these perforations. If these perforations can pass all the fluid injected, then the pressure will cease to rise and will stay at a level required to sustain the injection rate. Sometimes the capacity of these perforations is high enough that the pressure actually declines or breaks back.

The fluid probably will break down the formation first through the perforation where the formation is weakest. As this perforation takes fluid, its capacity to take fluid will be reached quickly. Fluid must then go out another perforation, presumably the one where the formation is next in weakness to the first perforation. This might be the perforation immediately adjoining the first one, under conditions of closely spaced perforations of three or four per foot.

After the second perforation has reached its capacity to take fluid, and the combined capacity of the perforations is less than the injection capacity of the fracturing pump trucks, then succeeding perforations will take fracturing fluid. Under most conditions it may be assumed that a perforation or fracture taking fluid will continue to do so throughout the fracturing job.

Capacity test . . . To understand this situation more fully, a simple experiment was set up to test the flow capacity of a single perforation to a sand-oil mixture. See Fig. 1 for details on experiment. The results of this experiment (see Table 1) indicate a flow capacity of a ⅜-in. perforation to be about 1.3 bbl. per minute at pressures of 200 to 300 psi.

Higher pressures were not employed in the experiment, as it was intended to carry out further experimentation under actual well conditions. However, the range of rates to be expected in a well as shown in the data obtained.

To determine the capacity of perforations under actual well conditions,

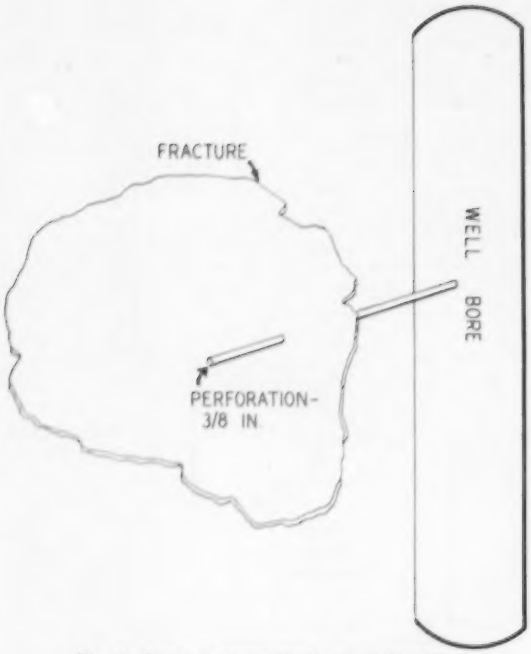


Fig. 2—Fracture perpendicular to perforation.

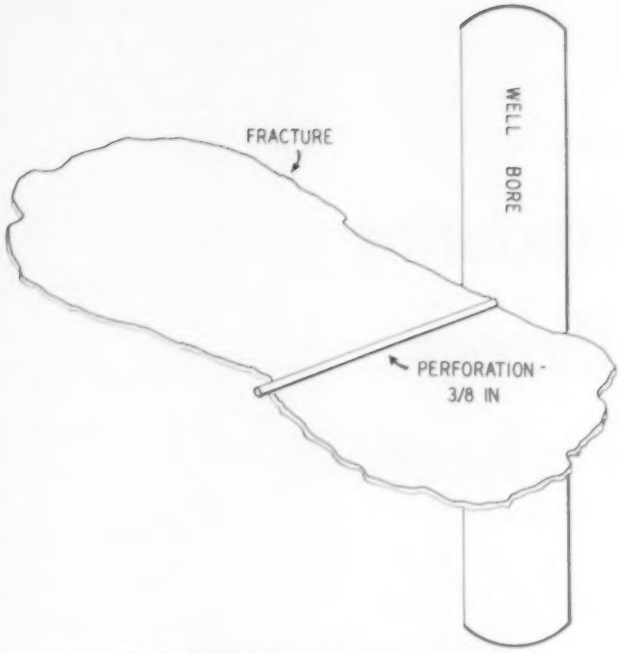


Fig. 3—Perforation in same plane as fracture.

NOTE: Drawings in Figs. 2 and 3 indicate plane or axis of fracture only. Size of fracture and direction are probably very irregular in most cases.

a well was perforated with five perforations placed at 3-ft. intervals. That is, one shot was placed every 3 ft. in a 15-ft. section, for a total of five perforations. A flow rate of 6.9 bbl. per minute was obtained, or a rate of almost 1.4 bbl. per minute per perforation.

This test proved the ability of a single perforation to take at least the 1.3-bbl. per minute rate under well conditions.

Additional wells were perforated and similar injection rates per perforation obtained (see Table 2). These wells represent a partial list of wells fractured at a rate of about 1 bbl. or more per minute per perforation. All wells are 1,000 to 3,000 ft. deep and surface pressure during fracturing ranged from 500 to 2,500 psi.

Perforations vs. production . . . The effect on production by limiting the number of perforations does not seem significant in areas where our company has experimented in this manner. Radial flow conditions causing congestion of flow through the pores near the bore hole may not be significant in the fractured well. A single perforation, existing at the beginning of a fracture, can in nearly all cases carry the volume of oil that will flow through the fracture. There should be no restriction caused by the fact that the fluid from a particular fracture can enter the well through only one perforation.

Experiments carried out in three fields and in over 30 wells show that wells fractured with few perforations are normal producers for the zones exposed. These experiments have been carried out for 2 years and the decline curves on the wells fractured are normal for the zones under production. The conclusions obtained from experiments of perforation capacity are that perforations do have a fairly definite capacity to take fracturing fluid. A recognition of this fact may be important in well-completion work.

How many needed . . . If, for example, two zones are encountered in a well, it may be desired to fracture both zones. Suppose each zone is 20 ft. and the zones are 50 ft. apart. If three perforations per foot are placed in each zone, then each 20-ft. zone will have 60 perforations, or 120 perforations in the well. If each perforation will take 1.3 bbl. per minute, under normal fracturing conditions, then each zone could absorb 78 bbl. per minute or both zones a total of 156 bbl. per minute, a rate obviously much higher than the capacity either of the pumps

TABLE 1
Results of Experiment to Determine Flow Rate of Sand-Oil Mixture Through ½-In. Perforation

Pressure difference through perforation, psi.	Rate of flow, barrels per minute
100	0.99
200	1.31
300	1.36

TABLE 2
Injection Rates Through Perforations During Hydraulic Fracturing*

Well No.	No. of perforations	Bbl. per minute	Bbl. per minute per perforation
1	5	6.4	1.3
2	5	6.7	1.3
3	6	8.1	1.3
4	5	6.3	1.3
5	30	41.0	1.4
6	6	7.0	1.2
7	10	9.5	0.9
8	7	7.3	1.0

*Fluid was oil containing 2 lb. of 20-40-mesh sand per gallon. Wells 1,000 to 3,000 ft. deep. Surface injection pressures 500 to 2,500 psi.

THE AUTHOR

Marion H. Stekoll is president of Stekoll Petroleum Co., Dallas, and of Stekoll Properties, a syndicate organized recently to invest up to $20,000,000 in production-buying ventures.

Stekoll is a petroleum-engineering graduate of Stanford University. He inherited and has rapidly built up a thriving pipelining and producing business launched by his father, Harry Stekoll, of Tulsa and Borger, Tex.

The younger Stekoll was one of the first operators to attempt ultraslim-hole drilling and completions of shallow wells (use of 2-in. line pipe for casing and 1-in. line pipe for rods). He has made it pay off especially in Bolton field in Kansas and Corsicana Shallow field in Texas (see The Oil and Gas Journal, May 28, 1956, page 207). Another of his engineering innovations was the introduction of the orifice method of measuring injection volumes of water at the input wells.

or of the casing at normal working pressures.

If a rate of 26 bbl. per minute is employed, then, at a capacity of 1.3 bbl. per minute per perforation, only 20 of the 120 perforations must necessarily take fracturing fluid. One hundred perforations may have served no purpose in the fracturing procedure. In this two-zone well under consideration, the 20 perforations that are affected may be in only one of the zones. If this occurs, then the other zone possibly would remain unfractured, with consequent loss of recovery. Obviously, this same reasoning may apply to a single zone of greater thickness, and the fracturing may be limited to only part of the zone unless thought is given to perforation capacity.

Beyond the casing . . . Of course, the capacity of a perforation is a phenomenon that concerns flow only from the well bore. Once the fracturing fluid has passed through the perforation, other factors become significant. Under conditions of fairly close perforation spacing, the condition of the cement is important. If the cement has become somewhat shattered by closely spaced perforations, then it is likely that the fracturing fluid will go out into the formation in one fracture, rather than in several fractures.

In other words, there would be communication behind the pipe and the fracturing job would be similar to that employed in an open hole. In certain wells and oil formations, this may prove the best method and result in better wells. In all matters pertaining to well fracturing, a certain amount of experimentation is required to determine the best procedure for the area.

If the cement is not affected by the perforations, then consideration may be given to the type of fracture expected. Each perforation is a hole about ⅜ in. in diameter and 6 to 12 in. long. When fracturing fluid is forced into this small hole, the resulting fracture may go in any direction. If a fracture perpendicular to the perforation hole is obtained (Fig. 2) the fracture would be parallel to and only a few inches from the well bore. Such a fracture could easily penetrate upper gas zones or lower water sands.

But if the face of the formation in the perforation is partially plugged off due to pulverized cement, mud, etc., the fracture may tend to be in a plane parallel to and containing the perforation hole* (Fig. 3). This type of fracture could go in any direction from the perforation, but would be in a plane parallel to the perforation. A fracture of this type also could go out the end of the perforation, and relative to the formation could be vertical or horizontal, or at any angle, depending upon formation conditions.

Multiple fracturing . . . If the formation is such that multiple fractures are considered the best, then the perforations probably should not be placed too close together. Recognition of the capacity of perforations will dictate methods of perforation and fracturing procedure that otherwise might not be used.

Stage fracturing (fracturing each zone with packers set between zones) has been used extensively, and often successfully. In some cases, stage fracturing has been replaced by larger fracturing jobs. But, analysis of the capacity of perforations will indicate that the larger fracturing job does not necessarily result in creating additional fractures, or, in the well mentioned previously, of the fractures going into both zones. Rather, it results in the fracture simply being extended, or enlarged, in the zone affected by the smaller fracturing job.

High rates . . . In the last few months higher-rate fracturing has become fairly successful in some areas. Two factors may be considered as the possible cause of success in this high-injection-rate work. If the well has been perforated closely, and the cement partially shattered or cracked, then the results will be the same as with a high-injection rate in an open-hole well. The use of very high rates in open-hole wells in some areas has proved successful. It is believed this success may be due to the erosional effect of higher rates in creating a larger or wider opening fracture.

The use of higher injection rates in perforated wells, where the cement is not broken up by perforations, is directly related to capacity of perforations. As the rate is increased, each 1.3 bbl. per minute of increase adds another perforation that is affected by the fracturing job and therefore adds another possible new fracture. A pumping rate of 26 bbl. a minute through perforations could create 20 fractures, as against 10 fractures for 13 bbl. per minute. According to this theory, increasing the injection rate during fracturing of wells has the same basic effect as stage fracturing.

Increased rate of injecting fracturing fluid probably does not increase the flow rate through any one perforation. Once a perforation breaks down and takes fluid, it probably will not take more than about 1.3 bbl. per minute before other perforations break down. If the volume of fracturing fluid is the same for both a slow or fast fracturing job, then the faster job simply results in more perforations being affected and more fractures created. With the same volume of sand employed, the faster job will result in smaller, more numerous fractures. The number of fractures caused by each rate of injection is therefore determinable, as is the amount of sand placed in each fracture.

By studying the results obtained and by considering the capacity of each perforation to take fluid, perhaps a step may be taken toward better control of fracturing jobs and the obtaining of more predictable results.

*Roscoe Clark, Western Co., Midland, Tex.

BOOKS

ELEVATED-TEMPERATURE PROPERTIES OF COPPERS AND COPPER-BASE ALLOYS, published by A.S.T.M., 1916 Race Street, Philadelphia 3. Heavy paper cover, 248 pp. $5.50.

This report is primarily a graphical summary of the elevated temperature data for coppers and copper-base alloys. Data for the coppers are limited to the wrought materials, while the data for the alloys apply to cast and wrought materials.

Data sheets giving the original data for drawing curves are included in the Appendix. Data sheets giving insufficient information for plotting or of such a nature as not to justify plotting are included also. These data sheets merit inclusion on the basis of contributing to the limited information available on many of the coppers and copper-base alloys. Data sheets give chemical composition shape, sizes, and processing information.

GEOLOGY OF THE GRASSY BUTTE AREA, McKENZIE COUNTY, NORTH DAKOTA. By E. G. Meldahl. Published by the North Dakota Geological Survey, Grand Forks, N. D.

The North Dakota Geological Survey announces the recent publication of a Report of Investigation No. 26 entitled, "Geology of the Grassy Butte Area, McKenzie County, North Dakota." The report covers 10 townships and adjacent areas in the vicinity of Grassy Butte, N. D. It consists of a combined geologic and structure map, accompanied by a diagram showing five stratigraphic columnar sections. These sections illustrate the various rock layers that are exposed in the map area. The text is printed on the back of the map and deals chiefly with the general geology of the region.

THE DEVONIAN STRATA OF THE LONDON-SARNIA AREA, SOUTHWESTERN ONTARIO. Published by the Michigan Geological Survey Division, Department of Conservation, Lansing, Mich., in cooperation with the Michigan Geological Society. 21 pp.

The 1956 field trip of the Michigan Geological Society covers the Devonian of the London-Sarnia area. Included are a detailed road log, a discussion of the Devonian rocks, and detailed correlations of the Devonian.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

Winter Pipelining Isn't a Picnic

It's a business designed to separate men from the boys

by J. E. Lyle

TO construct pipelines in cold weather, a contractor must be resolute and resourceful in order to overcome such difficulties as repeated snow removals, trenching in frozen ground, and adjustments of working methods to suit varying conditions.

An owner must have a strong justification for the project, great patience with delays and setbacks, and he must be prepared to pay the high costs of winter construction.

The operation of pipelines in winter is often rough work but it is not nearly so formidable as constructing them, for the most difficult operating problems have usually been considered in the design of a pipeline system.

Winter weather . . . The oil-producing areas of western Canada, being scattered across the Great Central Plain of North America and lying in the pathway of the prevailing westerly winds, have a rather dry continental climate. Annual precipitation amounts to about 18 in. of moisture, counting both summer rain and winter snow. Winter conditions begin during November and end in March, a period of 4 to 5 months.

During this time the temperatures range from just around freezing to 40° F. below zero, so that snow falling in early winter usually remains until spring. A large percentage of the short days are clear, calm, and cold. The worst winter condition is known as a blizzard, in which 20 to 30-m.p.h. winds drive falling snow with blinding force to smother roads and equipment under great hard-packed drifts.

During a blizzard, construction and operation of pipelines cease, for then all outdoor work and transportation are at a standstill. However, bright, dry weather at —10° F. is not unpleasant and tempts those trying to construct things in the open to proceed. Under such conditions pipelines can be built and operated.

Author is with Imperial Pipe Line Co., Ltd., Edmonton, Alta. Paper presented at 1956 A.S.M.E. Petroleum-Mechanical Conference, Dallas.

Methods . . . There are two methods of building pipelines in winter. The first is a split job whereby the line is welded and left on the surface of the frozen ground for operating until the following summer, when ditching, wrapping, and cleanup can be done in the normal manner.

Construction of a line by this method costs approximately one-third more than summer construction. It is a fast and comparatively easy method of supplying pipeline service; it is always used if the crude being moved can be handled when very cold.

Occasionally, oil with a high pour point is found which cannot be pumped through a surface line in winter. Then, if economic justification can be found, the second method of building a line is used; that is, a complete pipeline job, including wrapping and burying, is done in the cold weather.

This is slower and much more difficult and costly than the split-job method. It requires a sustained effort and considerable ingenuity on the part of the contractor, while the owner must be prepared to pay out from 1½ to 1¾ times as much for the line as he would for the same one built in summer.

Problems

The first problem of cold-weather pipelining arises with manpower. Suitable living accommodation is very difficult to obtain and winter camps for men are expensive and often uncomfortable. Clothing must be warm but not so heavy as to hamper movements or cause excessive perspiration during work.

On very cold days the men become more concerned with keeping themselves warm than with doing their work, which makes it difficult to accomplish much. This low working efficiency of men in cold weather, together with the short working days, due to the few hours of daylight available, seriously increases the cost of doing pipeline work.

Snow clearing . . . When the crews are established and ready to begin actual construction they are immediately faced with the removal of quantities of snow. This is a recurring problem which will hamper their work all through the job. Snow can be removed quite readily from access roads and rights-of-way by means of bulldozers, but when this operation must be repeated every other day or so, it becomes a costly task indeed.

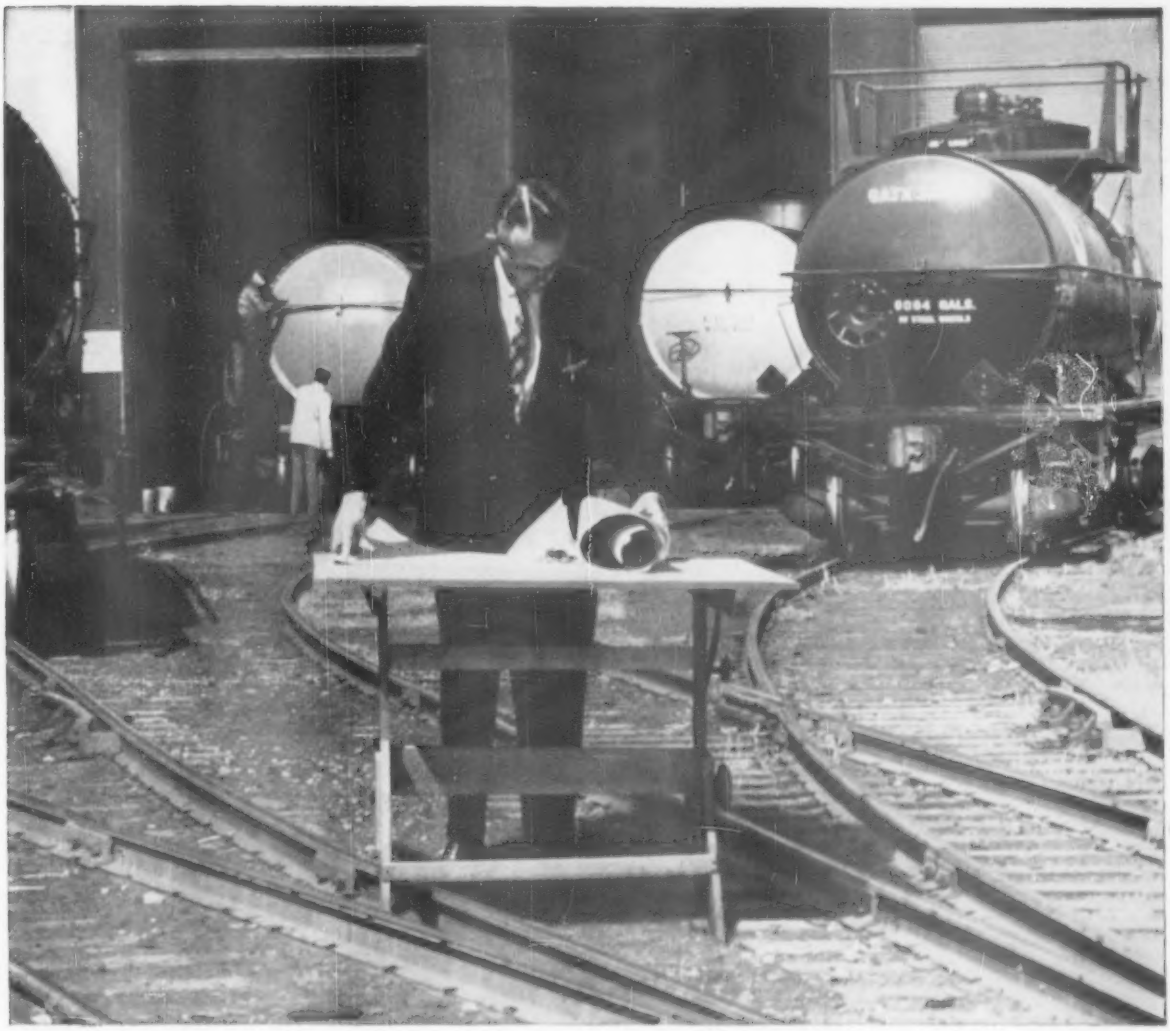
Sometimes it has to be done for each phase of the work such as for pipe stringing, welding, ditching, wrapping and, if it is very bad, for backfilling as well. Snow must be removed from joints of pipe before they are welded together in order to keep the line free of ice. If much snow drifts into an open ditch it must be cleaned out before the pipe can be lowered in.

Experience has shown that the most satisfactory method of clearing snow from a ditch is by hand. A gang of men with shovels have been known to do it faster and better than any of several machines tried out. Any organization of work which will eliminate repetitions of snow removal is worth trying. One contractor found it profitable to reduce the length of his pipeline sections to just what his spread could finish in one day. Thus, by keeping all men and machines bunched closely together, he could complete from 2,000 to 3,000 ft. of line each day with only one snow removal.

Plowing snow with a bulldozer in a settled area will wreck fences, hedge rows, and trees in shelter belts, all of which must be repaired or paid for the following spring. Drifting snow is one of the chief obstacles to cold-weather pipelining.

Welding . . . To do acceptable pipeline welding in winter weather, special precautions must be taken. The welder himself must be protected by adequate clothes, such as a flying suit and flying boots, and by shelters, so that he can concentrate on his exacting work without worrying about anything else.

Welding in temperatures lower than +10° F. is made difficult by the accelerated cooling rate of the steel, which is liable to develop cracks commonly known as shrinkage cracks in such weather. To guard against this, the rate



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of cooling can be reduced in several ways:

1. By preheating the ends of the pipes to be welded.

2. By having the hot pass, or second welding bead, put in immediately after the stringer bead.

3. By applying a filler bead and the finishing bead before the weld has cooled to air temperature.

4. By quickly wrapping the completed weld with a turn or two of asbestos felt paper.

5. By placing windboards or canvas shelters on the windward side of the welders doing the operation.

With care, successful welding can be done in this manner at —20° F. though if possible, it is much better to stop all field welding in any temperatures below zero. It is imperative to have X-ray inspection for the detection of cracks in welding done on pipelines in cold weather and it is well to have 50 per cent or more of the work X-rayed.

All these precautions add considerably to costs, and help make cold-weather pipelining an expensive business.

Ditching . . . The ground begins freezing from the surface downward in November and frost continues to penetrate until the end of February, when a maximum depth of from 3 to 6 ft. is reached, depending on the condition of the soil. Thawing, also from the surface downward, begins in March and is fairly well complete in late May or early June. An ordinary wheel-type ditcher can cut approximately 12 in. of frozen earth so that ditching for pipelines in the usual manner can be carried on successfully from early May until late November.

To dig trenches in ground with more than a foot of frost, some device must be used to help the ditching machine. A ripper, consisting of a single, very strong steel tooth mounted behind a tractor, will break up 15 to 18 in. of frost, and permit a ditcher to work. The ripper tears up such large pieces of frozen ground that a backhoe or bulldozer must be used to clear a path for the ditching machine. The huge lumps of frozen earth make backfilling very difficult.

A second and more satisfactory way of helping the ditcher is by thawing the ground along the ditch line by burning straw and slack coal on it for a period of 3 to 4 days. Burning a ditch costs close to 12 cents per lineal foot, if the straw and coal are available in the district. It has the advantage of making backfilling easy because the spoil bank is then in a crumbly state. Either way, ditching in frozen ground is very slow and costly.

Wrapping . . . A cleaning, priming, and wrapping job on pipeline in cold weather using a coal-tar enamel is inferior in quality to a similar job done in summer weather. Some factors contributing to this condition are:

1. Frost on the pipe.

2. Frost clinging to or freezing into the primer.

3. The very rapid cooling of the enamel with consequent cracking or checking with any movement of the pipe.

4. Damage to the coating when lowering the pipe into a frozen ditch.

Each of these factors must receive attention if an acceptable wrap job is to be obtained.

The best that can be done is on a comparatively short pipeline section in one swift operation. Frost can be removed by making two passes with the cleaning machine, the first of these without primer. By running the wrapping machine about 50 ft. behind the cleaning machine on its second pass, and preventing the freshly primed pipe from being lowered to the ground on skids, a passable wrap job can be obtained.

After wrapping, it is best to cradle the pipe straight into a snow-padded ditch in order to protect the coating. In cold weather no slack loops are required since the steel is contracted already more than it will ever be in the line. Therefore, backfilling should follow closely behind the wrapping to complete the operation.

Examination and re-jeeping, after spring thaw, of a number of small sections of pipeline coated and buried in this manner at 15° below zero, indicated that a fairly satisfactory job had been done. An acceptable bond and not too many holidays in the coating were found. At the same time it was felt that such a job was not as good as could have been done in summer.

Operating problems . . . Some of the problems of operating a crude-oil pipeline gathering system in cold weather include motor startup, pump suction and valve troubles, heating and circulating of high-pour-point crude in booster stations, and the scheduling of production to keep oil moving at all times through the main lines.

Motor startup . . . Though electric-driven pumps are the most convenient kind to use in a cold climate, electric power is not always available. There are many gas-driven motors in operation and starting such motors at 30° below zero can be a real problem.

Two ideas have been developed which solve most of the difficulties of cold-weather startup: (1) Gas-fired heaters, similar to domestic water heaters, have been used to warm the antifreeze in the motor blocks, and (2) a convenient electric plug-in mounted on the front bumper of the pumpman's vehicle makes it easy to use a warm fully charged battery on a self-starter.

These ideas have been very successful during the last 5 years.

Pump suctions . . . Suction lines in field batteries which do not produce enough crude to maintain continuous pumping become plugged with congealed oil and wax during the time tanks are being filled and pumps are idle. A small quantity of Varsol mixed with the crude lowers its pour point and makes it pumpable.

By arranging a bypass from the pump discharge to the suction and mixing about 1 qt. of Varsol in the crude oil left in the pump bleedoff sump barrel, the pipeline pump can be used to force the congealed oil back into the tank and clear the way for fresh crude to reach the pump.

Pump valves . . . Pump valves will not operate if the crude is congealed or if they become waxed up too much. To correct this situation, a fluid end heater for a field pump has been developed. A 200-watt length of lead-covered soil cable is wrapped around the case of the pump and enclosed in a neat metal box insulated with glass fiber. At a cost of $8.00 per month for electricity, each pump can be kept warm enough for satisfactory operation at any time.

Heating and recirculating . . . Crude arriving at tankage in a booster station in cold weather must be kept pumpable. This is done by using a large-capacity line heater of conventional design, on the stream just before it passes into the tank. Storage oil is recirculated back through the heater before pumping it out of the station. Though there is nothing new about heating and recirculating crude, it is not ordinarily done by pipeline operators and adds considerably to operating costs.

Scheduling production . . . In cold weather if high-pour-point crude can be kept moving through a pipeline, there is little chance of it congealing into a semisolid mass which can block further pumping. By obtaining the cooperation of the oil producers, schedules of production can be worked out to insure a quantity of oil for pumping at all times.

This can be complicated and requires careful planning and a large amount of good will between producers and pipeliners.

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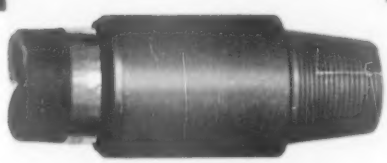

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Building a Catalytic Reformer?

Here are some suggestions which should help in selecting materials for construction

INTERNAL LINING of a fixed-catalyst-bed reactor at juncture of unprotected top-head insulation and stainless-steel sleeve protecting insulation over length of bed. Details of hex-steel-reinforced refractory and insulating concrete may be seen along with attachment for hex-steel and joint between sleeve and reactor shell. Fig. 2.

by J. J. Hur, J. K. Deichler, and G. R. Worrell

CATALYTIC reforming, at its inception nearly 5 years ago, became one of the more-important processes for the production of high-octane motor fuels. Currently, most petroleum refiners have at least one reforming unit and it is estimated that by the beginning of 1957 the total capacity in the United States will far exceed a million barrels per day.

There are numerous types of catalytic reforming processes in commercial operation. Although the purpose of each is much the same and there is some variation in the physical arrangement of the equipment and in the process flows, the principal and most important difference between the processes is the catalyst used. The catalyst sets the operating condition, regeneration requirements, and limitations on the type of charge stock that may be treated most effectively.

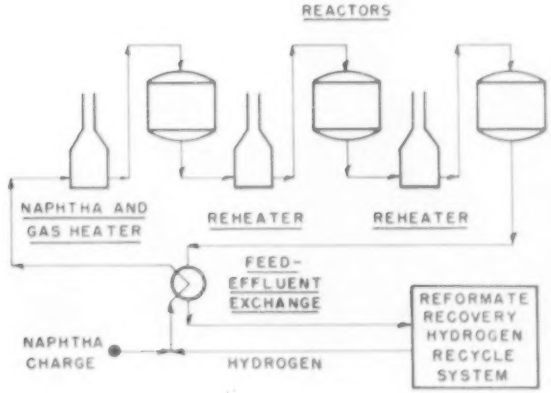
Authors are with Atlantic Refining Co., Philadelphia. Paper presented at A.S.M.E. petroleum-mechanical engineering conference, Dallas.

Most treatments of materials selection for catalytic reforming units may be considered generally applicable to all types of competitive processes. However, the information and data cited are drawn specifically from experiences in the development and commercial operation of the Catforming process.

Description of the Equipment

The problems of materials selection center around the high-temperature or reaction section of a reformer. Fig. 1 is a simplified flow and equipment diagram of the reaction section of a Catformer. Low-grade gasoline or naphtha upon being charged to the unit is mixed with hydrogen. The mixture is then wholly vaporized in a conventional tubular heat exchanger, brought to reaction temperatures of 850° to 975° F. in a direct-fired furnace and passed through a series of three fixed-catalyst-bed reactors.

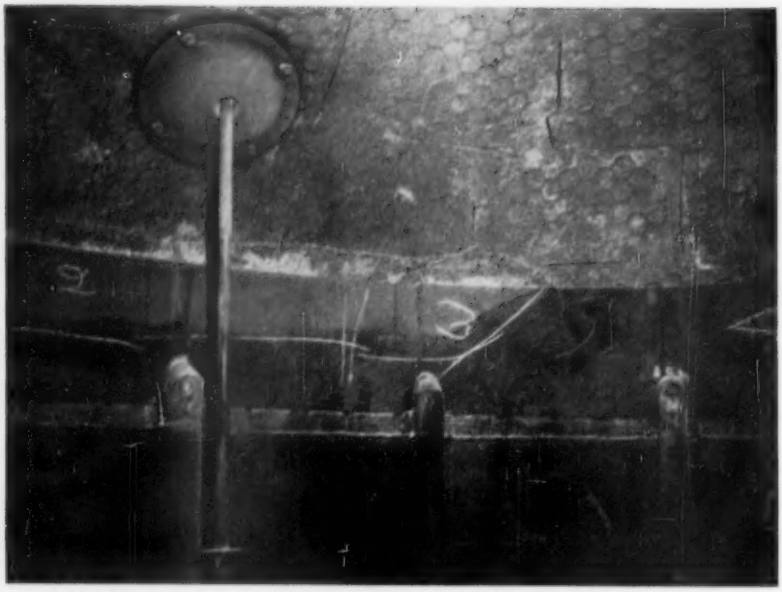
Two reheat furnaces maintain isothermal conditions over the reactor train. Effluent vapors from the reactors give up heat in exchange with the feed and then pass to a recovery and hydrogen-recycle system.



SIMPLIFIED process flow and equipment diagram of high-temperature or reaction section for Catforming process. Fig. 1.

Recovery system . . . This contains conventional equipment for condensing the upgraded gasoline or reformate, separating it from the hydrogen, and adjusting or stabilizing its vapor pressure. From the recovery system the bulk of the hydrogen is recycled to the feed while the balance is withdrawn, as make gas, as required to maintain the unit pressure at 500 to 750 psig.

Internal insulation . . . Special features of the reaction-section equipment include the reactors which are constructed with internal insulation. This permits the design and operation of these vessels at relatively low metal tempera-



SAME AS FIG. 2 showing lining in place. Note vertical expansion joints and stainless-steel "shingles" protecting juncture between top-head insulation and sleeve. Fig. 3.

tures, and therefore the use of carbon steel at a minimum shell thickness for the operating pressure. Generally the insulation consists of 3 to 4 in. of lightweight insulating concrete which is protected where exposed to the process flow with 1 in. of refractory concrete reinforced with hex steel.

Details of a typical installation are shown in Fig. 2. (The studs protruding from the vessel wall serve as attachments for the hex steel reinforcement of the top-head lining.) Such installations have been in service for over 2½ years without requiring any repairs.

A stainless-steel (Type 304) sleeve is usually installed over the internal insulation from the top of the bed to below the bed support to prevent the process gases from bypassing the catalyst. The sleeve is continuously welded to the reactor shell at the top and left essentially free at the bottom to allow for vertical expansion.

Circumferential expansion is compensated for by expansion joints extending the entire length of the sleeve. The upper section of a typical joint where it joins the reactor shell is depicted in Fig. 3. These joints are normally formed from light 12 to 14 BWG sheet with a radius of 1 to 1½ in.

Where heavier 10 BWG sheet has been used, cracking of the joints has occurred in service with the result that the process gases passed behind the internal insulation and cause local overheating of the reactor shell. It is believed these failures were caused by severe cold work required to form 1-in. radius joints from the heavier sheet.

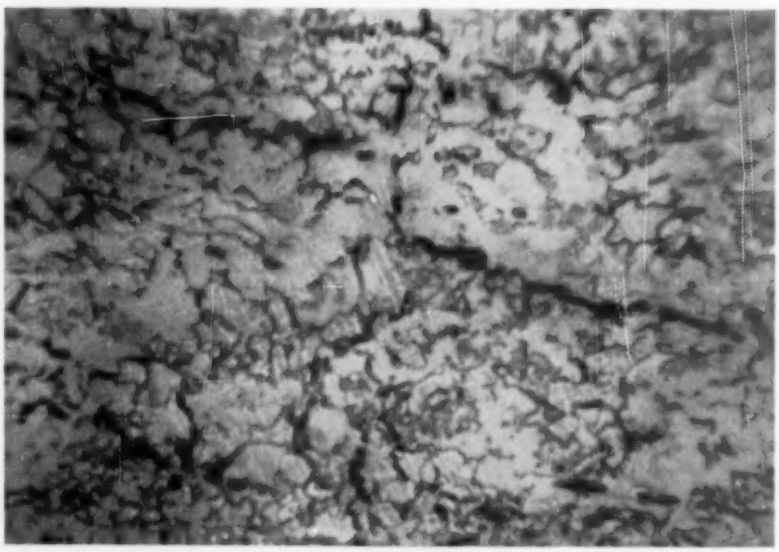
Another design feature of the equipment is based on the premise of minimizing hydrogen leakage. This has fostered the use of all-welded furnace tubes and headers in reforming units which is a departure from conventional refinery-furnace design. But all-welded construction eliminates the leakage at rolls and closure plugs that would be encountered if the usual furnace headers were to be used in this service. The fact that no coke is deposited in the furnace tubes (or if deposited is removed during catalyst regeneration) also facilitates the use of all-welded construction.

The first requirement imposed on the selection of materials for construction of equipment for the reaction section is that of precluding hydrogen attack. The deleterious effects of hydrogen under temperature and pressure on carbon and alloy steels are well known. Therefore, the lowest or minimum alloy steel that may be chosen is dictated by the resistance of that alloy to hydrogen attack under the design operating conditions of the equipment.

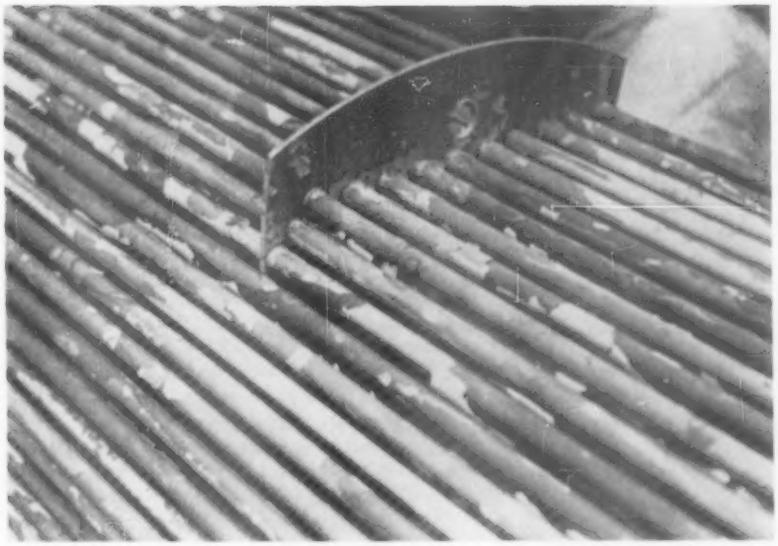
Alloys . . . It is the practice in the design of Catformers to limit the use of carbon steel to equipment which will operate below 500° F.; for equipment which will operate at 500° F. or above, the use of the low-chromium-alloy steels is recommended. This practice virtually eliminates the use of carbon steel except for the internally insulated reactor shells and for one-third to half of the feed-effluent exchange surface at the feed inlet or cold end. Piping or transfer lines, furnace coils, and the hot or effluent end of the feed-effluent exchange must then be of alloy construction.

The lowest alloy steel generally recommended and chosen for fabrication of transfer lines contains a minimum of 1 per cent chromium with ½ per cent molybdenum. This material is also used for the hot end of the feed-effluent exchanger when hydrogen attack is the only criterion for alloy selection. Higher (5 to 12 per cent) chrome alloys were originally used for fabrication of piping and exchangers; however, it will be shown that increasing the chromium above 1 to 2 per cent for the most part offers no advantage.

G. A. Nelson[1] has indicated that a practical temperature limit for 1 per



MICROSTRUCTURE of mild-steel, feed-effluent, exchanger tube decarburized and embrittled after several hundred hours' operation at approximately 600° F. and 500 psig. Fig. 4.



CONDITION of 5 per cent chrome-steel, feed-effluent exchanger bundle after 6 months of exposure to reactor-effluent vapors containing 0.04 volume per cent hydrogen sulfide and at about 870° F. Fig. 5.

cent chrome steel in hydrogen service and at reformer pressures is approximately 1,050° F. Consequently, a higher chrome alloy is required for fabrication of furnace coils because of the possibility that operating metal temperatures may exceed that limit. In the past, furnace coils have been constructed of 5 per cent chrome tubes and return bends. Now the majority are being fabricated of 2¼ chrome-1 molybdenum steel because of the allowable design-stress advantage.

In only one known instance has there been a failure in a Catforming unit attributable to hydrogen attack. The carbon-steel section of the feed-effluent exchanger was inadvertently operated several hundred hours at temperatures in the order of 600° F. The result was embrittlement of the tubes which fractured upon being removed for inspection during a unit turnaround. The decarburized and fissured microstructure of one of the exchanger tubes is shown in Fig. 4.

Hydrogen Sulfide Corrosion

When construction materials were selected for the first Catforming units, only modest consideration was given to the possibility of hydrogen sulfide corrosion occurring in the high-temperature equipment.

By virtue of the recycle hydrogen it is possible to build up the hydrogen sulfide formed in the desulfurization reactions to relative high concentrations in the reaction-gas mixture. However, it is a process advantage to keep that concentration to a minimum, particularly when treating high-sulfur naphthas, by removing hydrogen sulfide from the recycle gas before returning it to the reaction section[2].

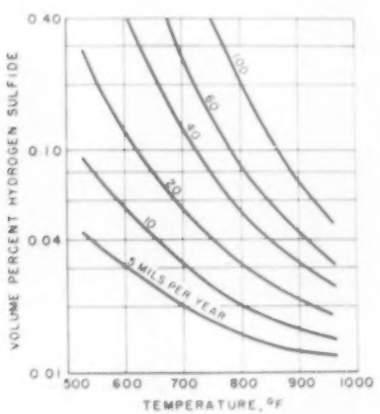
Under this condition and based on past experience in refining high-sulfur-bearing oils, it was believed that the low-chrome alloys, selected for their resistance to hydrogen, also would be immune to hydrogen sulfide corrosion. Fig. 5 is witness to the fact that this belief was not confirmed.

H_2S corrosion . . . The 5 chrome-½ molybdenum steel tube bundle shown in Fig. 5 was taken from the feed-effluent exchange of a Catformer after only 6 months of operation. The corrosion has occurred on the reactor-effluent side of the bundle at a rate equivalent to approximately 40 mils per year. The operating-temperature level was the order of 870° F. and the hydrogen sulfide concentration was about 0.04 volume per cent.

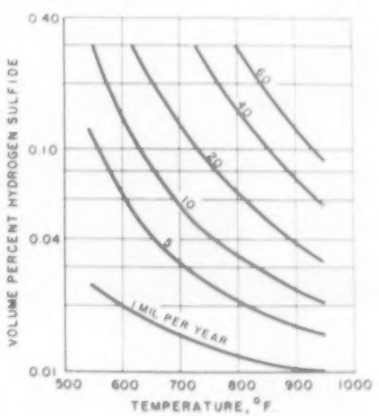
It will be noted that the sulfide scale on the tubes appears brittle and non-adherent. This characteristic of scales formed by the sulfidation of carbon and low-chrome alloy steels has in some instances magnified the effects of the corrosion. Not only has the service life of the equipment been impaired but the operability of the unit has been adversely affected as well. Sulfide scale flaking from the equipment preceding the reactors has collected on the top of the catalyst beds and introduced excessive pressure drop in the system.

H_2S content . . . At the onset of the problem it was apparent that the severity of corrosion at a given temperature level was primarily a function of the hydrogen sulfide content of the process gases. This was substantiated in laboratory and pilot-unit studies in which the corrosion rates of various alloy steels were determined under pre-

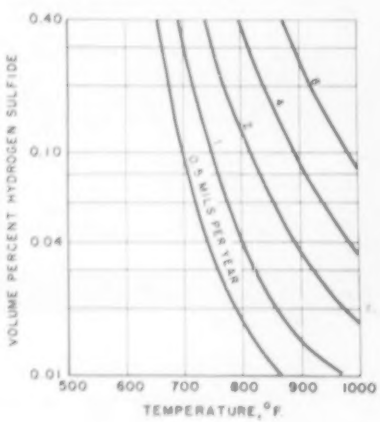
LINES of constant corrosion rate for carbon and low-chrome (up to 5 per cent Cr) steels versus temperature and volume per cent hydrogen sulfide in Catforming reation gas mixture. Fig. 6.



Same as Fig. 6 but for 11½ to 13½ chrome steel. Fig. 7.



Same as Fig. 6 but for 18 chrome-8 nickel austenitic stainless steel. Fig. 8.



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cisely controlled conditions of temperature, pressure, and hydrogen sulfide concentration. These studies also confirmed the results of other investigators[3,4,5] of corrosion in the hydrogen-hydrogen sulfide system (at much higher hydrogen sulfide concentrations than encountered in catalytic reforming) which indicated that under given conditions there was no significant difference between the corrosion rates of carbon steel and those of the chrome-alloy steels including those containing up to 9 or 10 per cent chromium. In fact there were indications that corrosion rates slightly increased as the chromium content was increased up to approximately 5 per cent.

Other alloys . . . In addition to the low-chrome steels, studies also were made of the 11½ to 13½ per cent chrome steels, the 18 chrome-8 nickel austenitic stainless steels, and aluminum-coated steels. Of these the austenitic alloys and the aluminum-coated steel show excellent resistance at all hydrogen sulfide concentrations investigated. On the other hand the 11½ to 13½ chrome alloys exhibited corrosion rates approaching half to two-thirds those of the low-chrome alloys.

Corrosion rates . . . Fig. 6 charts lines of constant corrosion rate for carbon and low-chrome (1 to 5 per cent) steels as a function of temperature and hydrogen sulfide concentration (in volume per cent). This chart was prepared from correlations of the laboratory and pilot-unit test data supplemented by data from plant tests and measurements of metal loss of operating-plant equipment. Since the bulk of the data represented corrosion rates at 900° F. temperature dependency was determined from the data of Dittrich.[3] Figs. 7 and 8 are similar charts for the 11½ to 13½ chrome steels and for the 19 chrome-8 nickel stainless alloys, respectively.

These charts (Figs. 6, 7, and 8) are intended for selection materials for equipment to operate under environmental conditions similar to those found in a Catformer. That is to say an environment containing 10 to 15 per cent hydrocarbon vapors and 85 to 90 per cent hydrogen at pressures in the range of 400 to 800 psig. The recent work of Backensto, et. al[6] suggests these charts should not be extrapolated much beyond 1,000° F. because of indications that corrosion rates decrease with increasing temperatures above approximately 1,100°F.

Based on Fig. 6 it is indicated that the low-chrome alloys would not give satisfactory service in units which the hydrogen sulfide content exceeded about 0.015 volume per cent unless an inordinately high corrosion allowance (over 0.125 in.) were provided. This would essentially limit the use of these alloys to units treating naphthas containing less than 0.05 weight per cent sulfur and incorporating facilities for removing hydrogen sulfide from the recycle gas, or to those treating predesulfurized feed stocks.

However, in practice it has proven more economical to use low-chromes piping and furnace coils with high corrosion allowances (up to 0.250 in.) than to select a high-alloy steel even in Catformers in which the hydrogen sulfide may approach 0.05 volume per cent.

Although it is well known that under most circumstances sulfide scales are ineffectual in stifling corrosion it appears that when in compression they are less permeable to the corrosive gases and less likely to flake from the metal surface. Thus the service-corrosion rates of low-chrome piping and furnace tubes are probably somewhat lower than those indicated in Fig. 6.

The foregoing considerations also apply when selecting construction materials for the shells of the portion of the feed effluent exchanger that will operate above 500°F. In selecting the tube materials it is the practice to use the charts without modification. The tubes are the most critical elements in the reformer because leakage would allow at least a part of the charge stock to bypass the reactors with a resultant loss in octane improvement. By virtue of their thin walls little, if any, corrosion allowance is provided in exchanger tubes. Consequently, since it occurs on both sides of the wall, very little corrosion can be tolerated if the integrity of the process is to be maintained. Thus, it is recommended that the use of low-chrome-alloy exchanger tubes be limited to units in which hydrogen sulfide concentrations do not exceed 0.015 volume per cent. Above that concentration it is preferred to select the austenitic stainless steels.

For the most part the 11½ to 13½ chrome steels have not been used in Catforming units, although, as indicated by comparison of Figs. 6 and 7, they should provide somewhat more corrosion resistance than do the low-chrome alloys.

Sorell and Hoyt[7] have pointed out that in catalytic-reforming service the 12 per cent chrome alloys have behaved erratically and that the indicated improvement in corrosion resistance may not be affected. In addition it has proved economical and practical to take the more significant gain in corrosion resistance by using the 18 chrome-8 nickel stainless steels for the slight additional cost over the 12 per cent chrome steels.

Although exhibiting resistance to sulfidation equal to or greater than that of the austenitic stainless steels, aluminum-coated steels have not been used in the fabrication of Catforming equipment thus far. However, aluminized equipment has been used in other catalytic-reforming processes with reported success.[8]

Summary

The selection of materials of construction for catalytic reforming units is based on two premises: 1, preclusion of hydrogen attack, and 2, providing resistance to sulfidation or hydrogen sulfide corrosion. Therefore, it is the practice to limit the use of carbon steel to equipment which will operate up to 500° F. Low-chrome steels containing a minimum of 1 per cent chromium are recommended for piping, furnace coils and exchanger shells which will operate above 500° to a maximum temperature of 1,050° F.; where metal temperatures are expected to exceed 1,050° F. the minimum permissible chromium content should be increased to 2 per cent. Corrosion allowance should be provided in the equipment consistent with hydrogen sulfide content of the process gas.

Heat-exchanger tubes to operate at 500° F. and above may be fabricated of low-chrome alloys provided the hydrogen sulfide content of the process gas will not exceed 0.015 volume per cent; above that concentration of hydrogen sulfide the 18 chrome-8 nickel austenitic stainless steel tubes should be selected.

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(See also Neumaier, B. W., and Schillmoller, C. M., "Battle Catalytic Reformer Corrosion," The Oil and Gas Journal, May 28, 1956, page 121).

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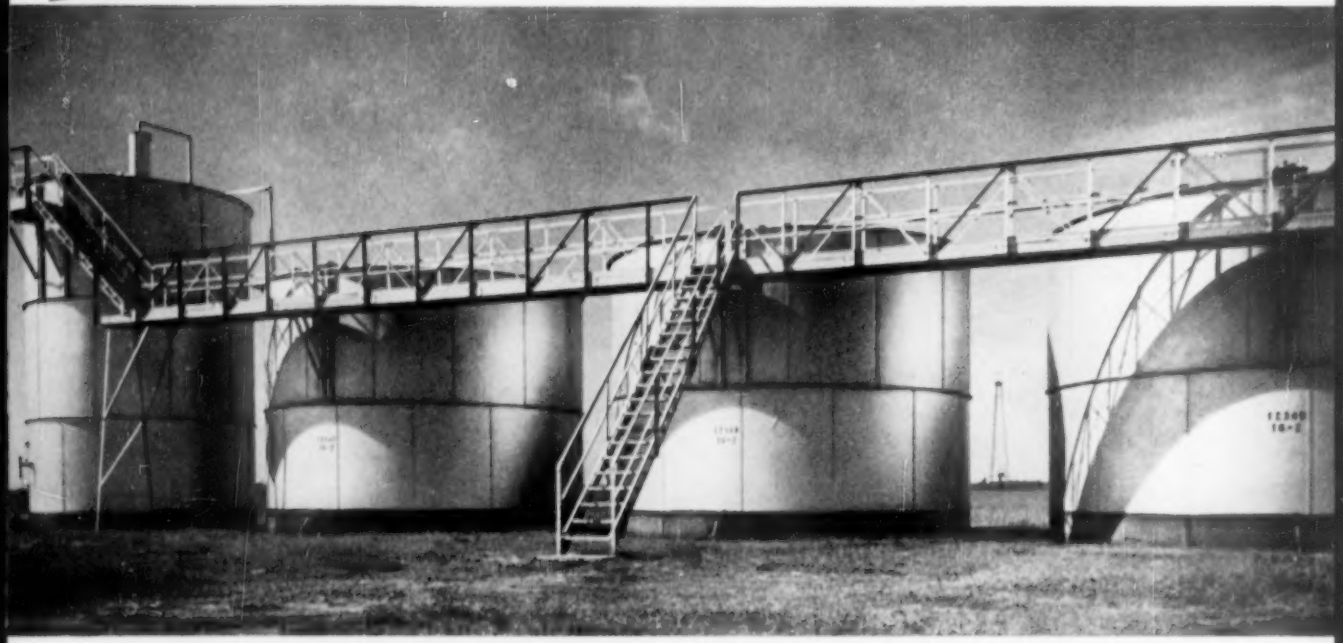

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What you ought to know about

Separation of Oil and Water

by Dr. John M. Campbell

INASMUCH as oil and water occur together in the reservoir their separation at the surface is a basic problem. They are substantially insoluble so that gravity separation is possible even when they are emulsified and chemical and/or heat treatment is necessary.

Equipment for performing this separation must have provisions for controlling the level of the interface between the oil and water, the top of the oil level, and the vessel pressure. The interface level may be controlled by the standard liquid-level pilot equipped for such purpose.

However, the control is less positive because the densities of the two liquids are closer than liquid gas in the normal separation. However, the chief drawback to that type of control is cost. Consequently other methods have been developed.

Simple system . . . The simplest separation system is that represented by a low-pressure free-water knockout of the type shown in Fig. 1. The free water settles out to the bottom and the oil and gas pass overhead—usually to a treater. The outlet B is extended into the vessel to insure the presence at all times of a gas cap and to control the oil level.

Author is consultant and staff member, School of Petroleum Engineering, University of Oklahoma, Norman, Okla.

The location of the oil-water interface E is fixed by the position of adjustable nozzle D. Since the water outlet box is vented into the gas cap, rotation of this nozzle changes the interface level for:

$$d_o\rho_o + d_w\rho_w = S_w\rho_w + \Delta P_f \quad (1)$$

Where:

d_o = thickness of oil in vessel, ft.
d_w = height of water in vessel proper, ft.
S_w = height of water in outlet box.
ρ_o, ρ_w = density of oil and water respectively, lb. per ft.^{3}
ΔP_f = pressure drop in downcomer pipe and outlet box, lb. per ft.^{2}

In a well-designed system operating at normal capacity ΔP_f may be neglected. Equation 1 may then be rearranged to read:

$$d_w = S_w - d_o(\rho_o/\rho_w) \quad (2)$$

Consequently any change in S_w will cause a corresponding change in d_w and d_o. As S_w is decreased d_o gets larger so that small changes in S_w give correspondingly larger changes in d_w.

Water removal . . . Water is removed from the vessel with a simple weight-loaded, self-acting diaphragm valve. With the top of the diaphragm vented into the vessel gas cap the only force acting on the underside of the diaphragm is the head of liquid. The weight is then simply adjusted on the arm to compensate for the desired liquid head operating the valve.

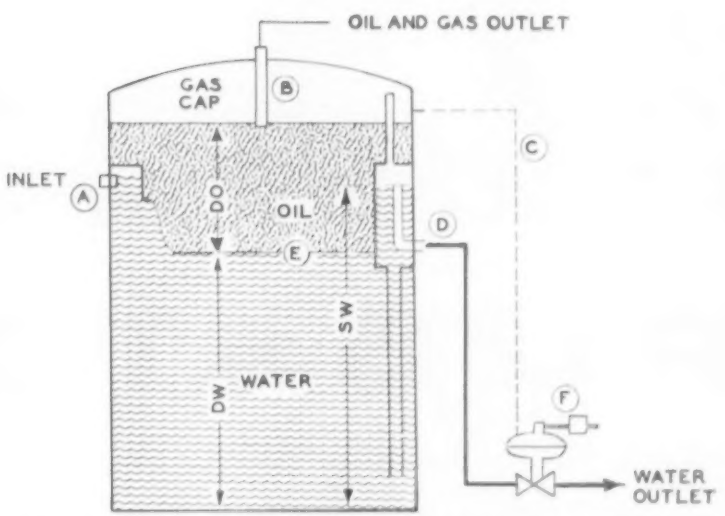
This is really a form of back-pressure service but only a valve designed specifically for such service should be used. No back-pressure valve is shown on the oil-gas line because this type of vessel often floats on the line between the well and treater. If this were not the case such a gas back-pressure valve would be needed.

Fig. 2 shows a similar system for a treater. In this case though an additional valve is necessary to remove the oil which is separated from the gas in the top section. This valve operates in the same manner as the water valve.

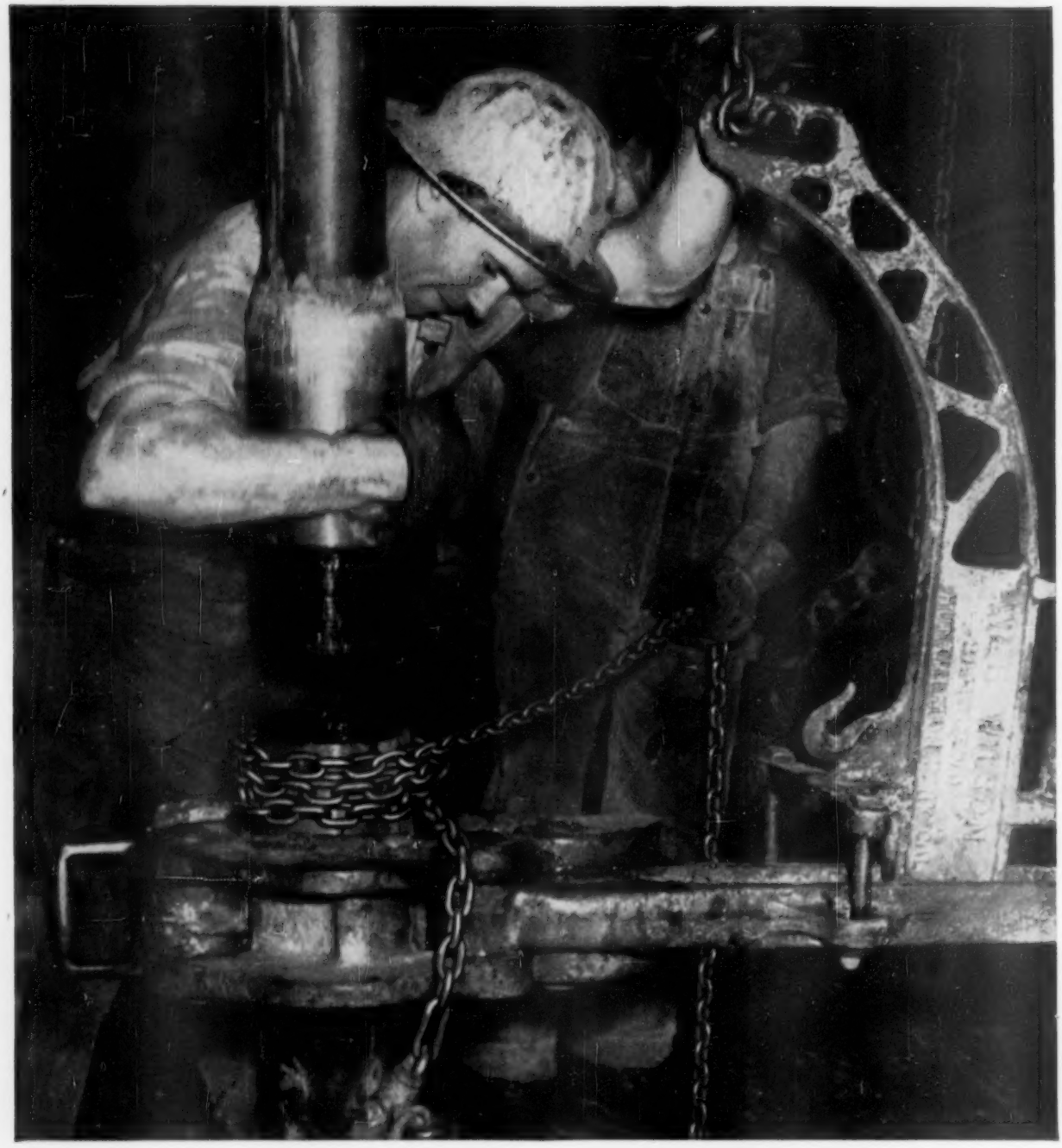
The water syphon G is a type commonly used and the principle is the same as the rotating nozzle. It must also be vented back into the gas space. The oil outlet is a fixed opening so located that a gas cap may be preserved below the top plate.

The control system shown with the high-pressure free-water knockout in Fig. 3 is similar to Fig. 1. In this case though a conventional liquid-level controller is incorporated into the water-outlet compartment.

The oil simply overflows into the gas-outlet line with the combined stream passing through the gas back-pressure



SIMPLEST SEPARATION system is this low-pressure free-water knockout where water settles to the bottom and oil and gas pass overhead. Fig. 1.



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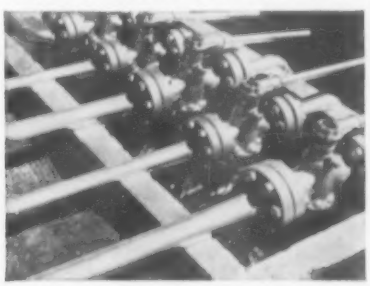

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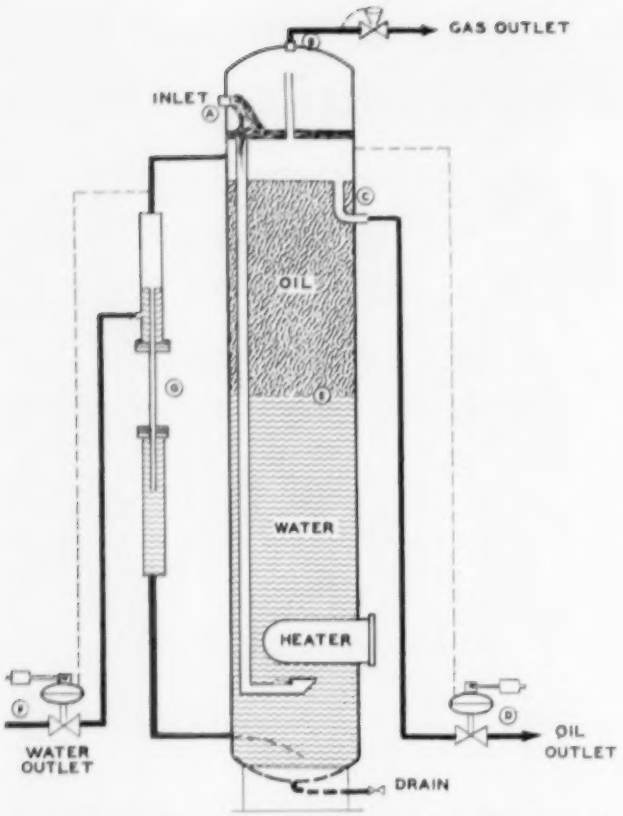
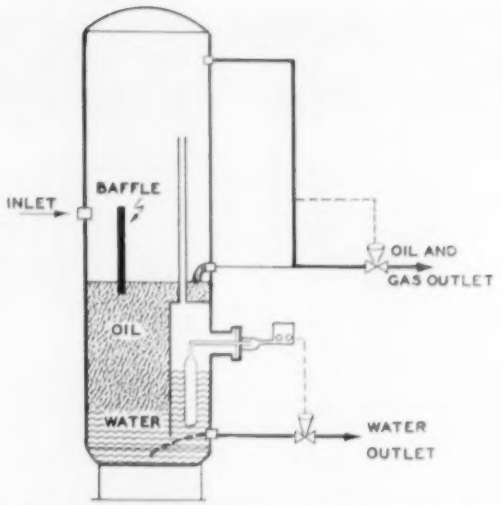


TREATER SYSTEM of water and oil separation is similar to the free-water knockout (Fig. 1) but a valve is provided for control of the discharge of both oil and water. Fig. 2.



HIGH-PRESSURE KNOCKOUT of free water has liquid-level control on water outlet. The oil overflows into the gas outlet line. Fig. 3.

valve. Because of liquid surging the controlling connection should be upstream from where streams commingle.

Vessel Sizing

Any liquid-liquid separation vessel must be sized to accommodate the gas load without entrainment and have sufficient cross-section area and liquid volume so that the heavier fluid can settle out in the time it is retained in the vessel.

It was once felt that entrainment greater than that from separators could be tolerated but experience has shown this to be undesirable. Consequently the gas capacity should be determined in the same way as for gas separators *(Part 1, The Oil and Gas Journal, page 107, March 14, 1955).*

The sizing for liquid capacity is considerably more of an art than a science. The best approach makes use of basic force concepts and the application of Stokes Law to a free-settling particle.

The force causing a particle to settle is:

$$F = m_w g - m_o g - F_d \qquad (3)$$

since:

$$F = m_w (dv/dt) \qquad (4)$$

$$m_w (dv/dt) = m_w g - m_o g - F_d \qquad (5)$$

From this equation one may obtain:

$$m_w [(\rho_w - \rho_o)/\rho_w] g = F_d \qquad (6)$$

if it is remembered that:

$m_o = \rho_o \times$ oil volume.

$m_w = \rho_w \times$ water volume.

Since the volume of oil displaced must equal the droplet volume:

$$m_o/m_w = \rho_o/\rho_w$$

When the droplet has reached an equilibrium velocity:

$$dv/dt = 0$$

From Stokes Law:

$$F_d = 3\pi \mu v D_p \qquad (7)$$

Combining Equations 6 and 7 yields:

$$v = \frac{g D_p^2 (\rho_w - \rho_o)}{18 \mu} \qquad (8)$$

if the droplet is assumed to be spherical:

$$m_w = (\pi D_p^3/6) \rho_w$$

The equation is sound enough but in the actual vessel absolute free settling cannot occur. Furthermore the particle size D_p not only varies but is indeterminable. The path of the droplet also takes it past fluid of varying density. Consequently the use of Equation 8 involves the use of several assumptions.

The velocity obtained from Equation 8 may be used to determine vessel diameter by the equation:

$$D_v = [(0.000083) Q/v]^{1/2} \qquad (9)$$

Where both gas and liquid are separated in the same vessel as shown in Fig. 3 the necessary diameter would be one that would satisfy Equation 9 and still handle the gas load.

Nomenclature

D_v = vessel diameter to handle liquid, ft.
D_p = diameter of water droplet, ft.
F = force of motion of particle, poundals
F_d = resisting force to motion, poundals
g = gravitational acceleration, ft. per second^2
m_w = mass of water, lb. mass
m_o = mass of oil, lb. mass
Q = water load, bbl. per day
v = droplet settling velocity, ft. per second
t = time, seconds
π = 3.1416
ρ_w = density water, lb. per cu. ft.
ρ_o = density oil, lb. per cu. ft.
μ = viscosity, lb. per ft.-second

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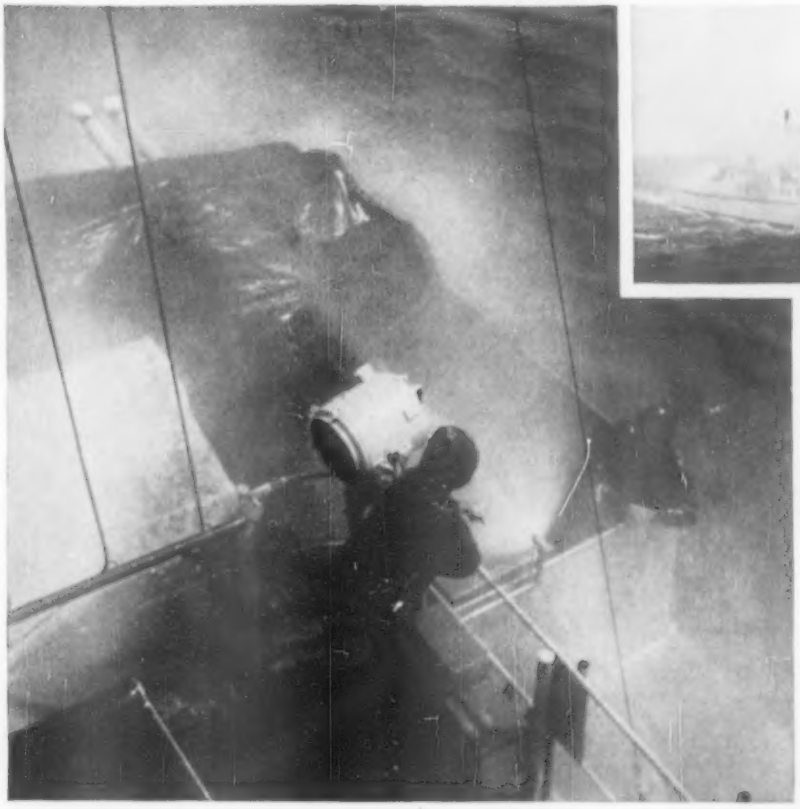

Pipe and fittings of Geon are joined easily with solvent cement, simplifying installation.

Now ships shower themselves

to wash away radioactive contamination

NUCLEAR explosions produce a deadly byproduct—radioactive fall-out. As a counter-measure, the Navy has devised a washdown system which enables a ship to spray itself with thousands of gallons of sea water, washing away contamination within minutes.

First, metal piping was tried for the system—but it added too much weight. The answer was found in rigid vinyl plastic pipe, made of Geon polyvinyl materials. This piping weighs but one-fourth as much as metal. It's impervious to sea water's corrosive effects, unaffected by either freezing or tropical temperatures. And, using simple but strong solvent-welded joints, it's so easy to install that the ship's crew can do the job easily. The washdown system was developed by the U. S. Navy's Bureau of Ships. The Grinnell Company, Inc. was the principal contractor in this effort.

This is only one of the many applications of Geon polyvinyl materials, ranging from rigid products like ductwork to flexible products like upholstery, from coatings for textiles and metal, to foam for cushioning and crash padding. Investigate this remarkable material for *your* products.

For more information write Dept. DT-12, B. F. Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, O. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B.F.Goodrich Chemical Company
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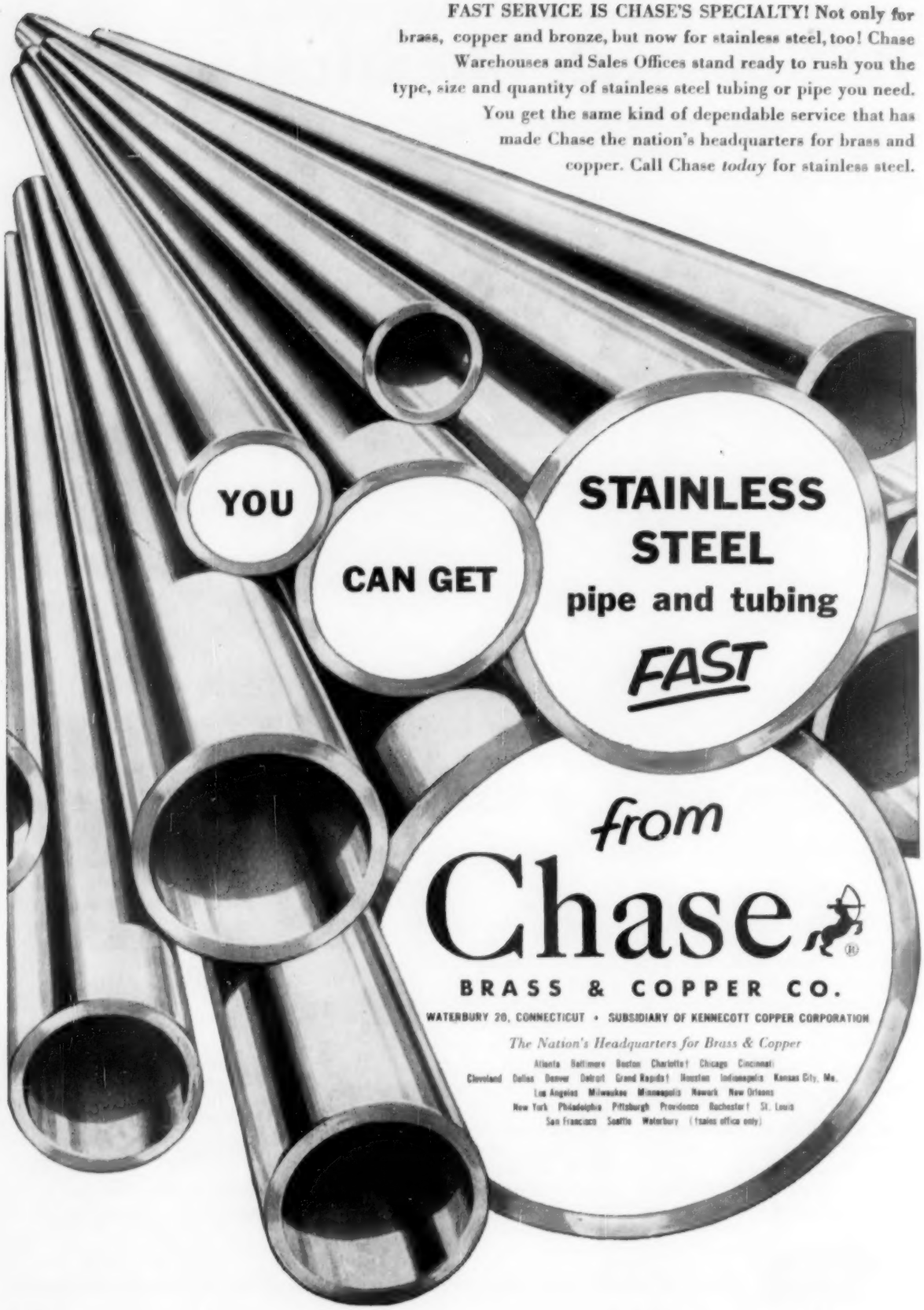
B.F.Goodrich GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors


FAST SERVICE IS CHASE'S SPECIALTY! Not only for brass, copper and bronze, but now for stainless steel, too! Chase Warehouses and Sales Offices stand ready to rush you the type, size and quantity of stainless steel tubing or pipe you need. You get the same kind of dependable service that has made Chase the nation's headquarters for brass and copper. Call Chase *today* for stainless steel.
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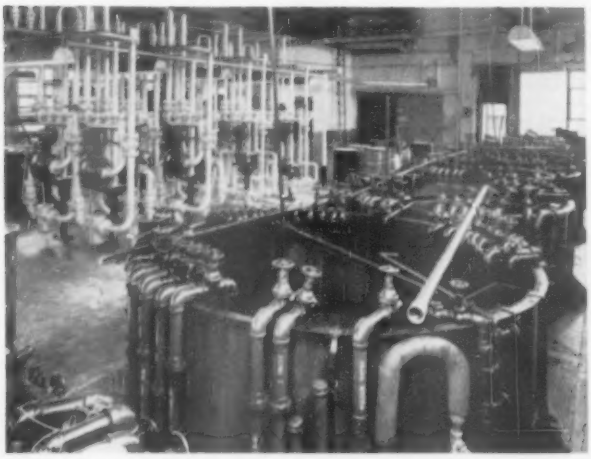
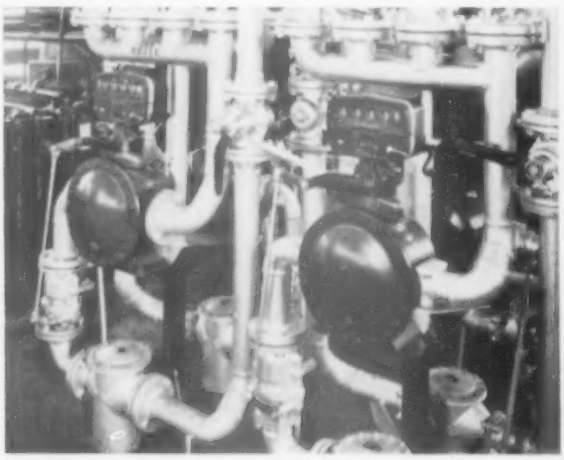


MANUAL BLENDING methods have been replaced by the compact metering system in the background. Each meter handles a separate lube-oil component.



AUTOMATIC METERING meets specifications without error. All meters feed into the overhead 4-in. rundown line which conducts blend to mixing tanks.

Standard of California reduces batch time as . . .

Automatic meters blend lube oil faster

MORE accurate and faster blending of lube oils is being made possible by automatic-metering facilities recently installed at the Richmond, Calif., refinery of Standard Oil Co. of California.

Previously base stocks and additives were pumped one at a time into the blending tank. This method not only was time-consuming, but was subject to possible human errors in gaging. After a batch was mixed, additional time was lost while tests were run to assure that the product was meeting specifications.

The hundreds of valves and thousands of feet of pipe required to serve the many blending tanks have been replaced by 16 meters and a simple manifold system. A single header connects the installation to a battery of 12 mixing and storage tanks. These range in size from 250 to 1,000 bbl.

Average blending time with the new facilities is one-fourth of that formerly required. For example, the stick-measure method required about 4 hours for blending a 500-bbl. batch. The new method now requires only 1 hour. The old blending tanks are still used for some specialty oils, but all large volume lubes—accounting for some 85 per cent of the plant's output — are blended by the new facilities.

Material furnished by Kenneth Loomer, Standard Oil Co. of California.

Meter system design . . . The new blending facilities were installed in one corner of the lube oil house. New lines, 2, 3, and 4-in. in diameter, were run to tanks where the base stocks and additives are stored.

The battery of 16 meters, each handling a separate base stock or additive, is grouped for convenience in four banks as shown in accompanying photographs. A full-opening, quarter-turn gate valve, strainer, and Quantrol valve are installed ahead of each meter.

The meters range in capacity from 120 to 350 g.p.m. They operate at high rates until nearly all of the preset quantity has been metered. At that time the two-phase, slow-closing valves automatically operate to reduce the flow. More accurate metering and shock-free shutoff is thereby provided. The valves can be adjusted over a wide range. Length of line between the tank and meter, line size, and viscosity of the fluid determine how much of the preset volume is metered at the slower rate.

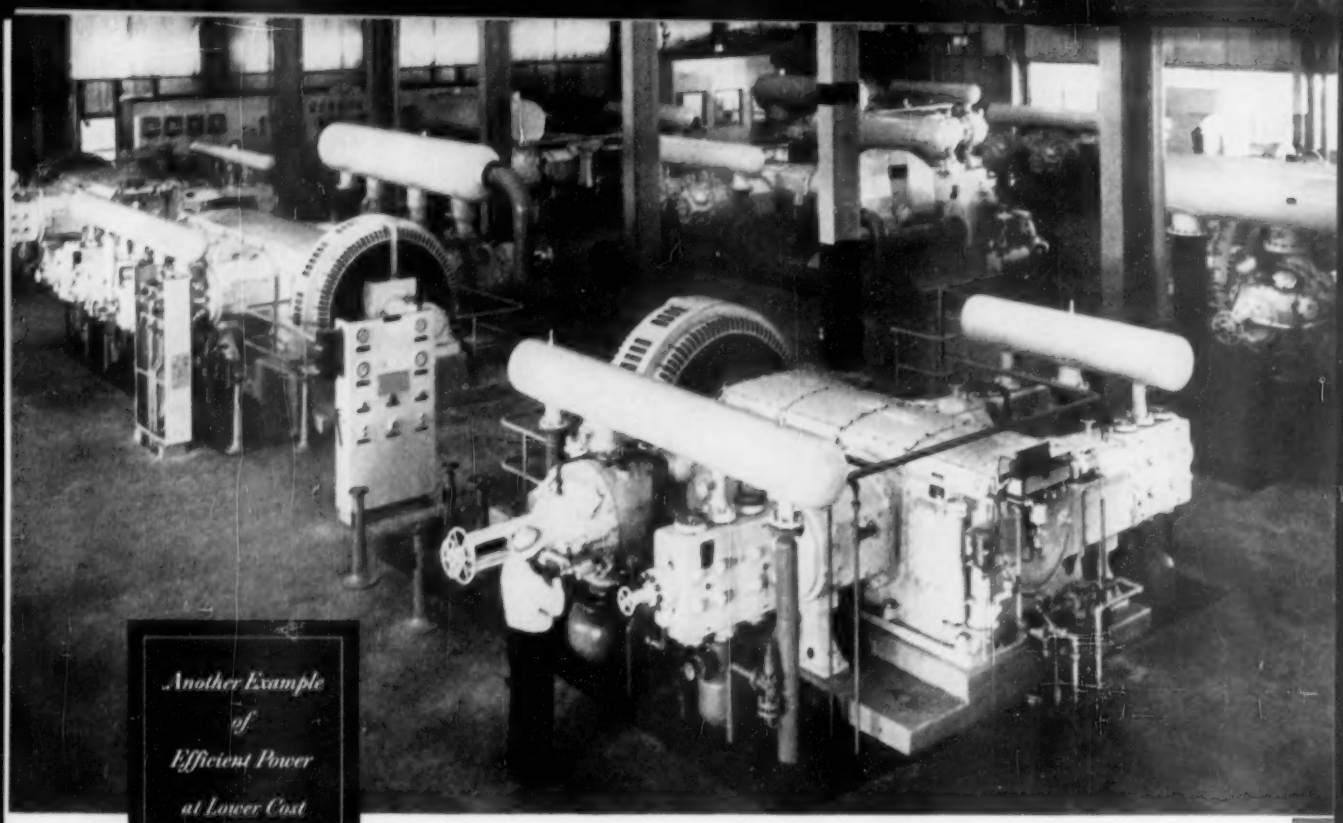
From the meter each component passes upward through a manifold to an overhead 4-in. line which slopes down to the mixing-storage tanks. Currently, only one outlet is provided at each header. Three others have been blanked off, however, so that in the future three additional lines can be added. Plans for adding an additional rundown line are under consideration.

All lines from the meters were fabricated so they enter at the top of the 4-in. rundown line. Spring-loaded check valves placed just above the line keep all lines full up to that point. This assures that each batch will be exactly as metered, as well as eliminating contamination of a blend by ingredients left over from the preceding batch. The 4-in. rundown line is always purged with air after all the oils for a batch have been run into the mixer.

How operated . . . In mixing a particular batch the operator is given a ticket on which the amounts of each base stock and additive are listed. He sets off these amounts on the individual meters and then inserts the ticket to obtain a printed record of the meter reading before flow is started. Each meter prints in a different portion of the special ticket, and in different positions at the beginning and conclusion of the run.

After a three-way valve is opened in the rundown line to connect it to the proper mixing tank, flow of all components is started. As soon as the tank is partially filled, mixing is started. Thus not only is time saved through simultaneous flow, but it is not necessary to wait until the last component is in before mixing can be started.

When the preset volumes of all components have been metered, the slow-



This over-all plant view shows several of the compact Cooper-Bessemer M-Line compressor units that deliver dependable performance in the Brea Chemicals, Inc. modern ammonia plant near Los Angeles.

HERE'S MULTIPLE-SERVICE FLEXIBILITY IN MODERN AMMONIA PRODUCTION

. . . with Cooper-Bessemer JM Compressors

● Twelve Cooper-Bessemer JM compressors, totaling 17,500 horsepower, are doing an efficient, economical job of handling a wide range of compressor services in the Brea Chemicals, Inc. 13-million-dollar ammonia plant near Los Angeles.

JM-4's for air, ammonia, mixed gas, hydrogen and recycle service, and JM-6's handling nitrogen compression, offer important savings to this producer of 235 tons of ammonia daily.

Here, to list but a few, are reasons why Brea, like so many other modern chemical producers, benefits from Cooper-Bessemer's century of compressing experience: there's extreme flexibility to handle a wide range of pressures and different gases, advanced design and metallurgy afford unusual strength and rigidity, there's five-step unloading at constant speed, the crankshaft is a steel forging of exceptionally large diameter thus low unit bearing pressures, compressor cylinder jackets are designed to insure adequate, uniform cooling, and the JM's exceptional compactness does not sacrifice accessibility or ruggedness.

If you're interested in compressing, write or call for full details . . . learn about *all* the plus features of these modern units. The nearest Cooper-Bessemer office will gladly cooperate.

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DIESELS • GAS ENGINES • GAS-DIESELS • ENGINE-DRIVEN AND MOTOR-DRIVEN COMPRESSORS

closing valves automatically stop flow. The operator then again inserts the ticket to get the final meter reading. In this manner a printed record is obtained of exactly what stocks and additives, and the amounts of each, went into each batch. There can be no question of what was added, such as when an operator turned a wrong valve into the old blending tanks.

In addition to other savings, it has been possible to reduce by about 30 per cent the number of tests run on batches of oil.

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Simple coding method improves safety

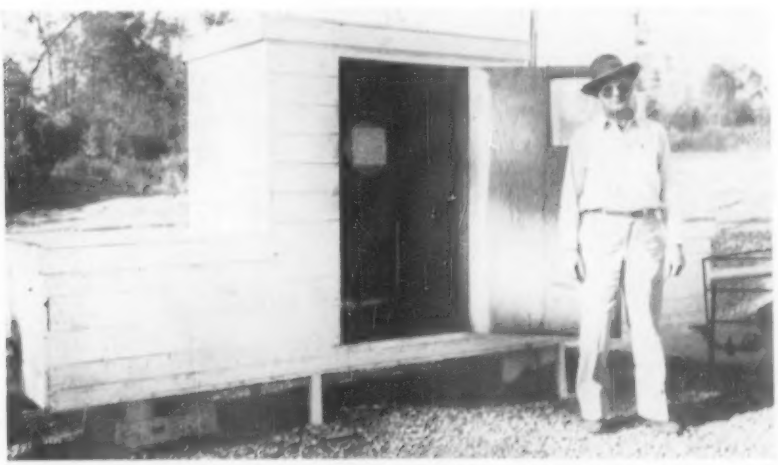
WORKERS can tell at a glance what sort of material is stored in any tank at Dow Chemical Co.'s Midland, Mich., petrochemical plant. And best measures for safety and fire-fighting practices are indicated at the same time.

Dow uses a simple coding device to accomplish these aims. Each tank has a circle and a bar painted on it in a conspicuous place. If the circle is above the bar, the material stored in the tank is lighter than water. If the circle is below the bar, the material stored therein is heavier than water.

If the circle is solid red, the stored material is inflammable. If the circle is solid black, the material in the tank is not inflammable. A circle half red and half black indicates that a mixture of inflammable and noninflammable materials is stored in the tank.

The six possible codings are shown in Figs. 1 through 6. Cross-hatched areas are painted solid red on the tanks. In Fig. 1, the material is inflammable and lighter than water. Fig. 2 shows an inflammable material which is heavier than water. Figs. 3 and 4 shows a noninflammable material, lighter and heavier than water, respectively.

Storage of mixtures is taken care of as shown in Figs. 5 and 6. In Fig. 5, the material is lighter than water, and is a mixture of inflammable and noninflammable. In Fig. 6, the material is heavier than water, and is a mixture of inflammable and noninflammable.


INSULATED SHELTER protects recording devices from weather.

Lease house provides meter-run shelter

A COLD-WEATHER hint may be found in a meter-run shelter Sunray Oil Corp. uses on some of its leases in North Louisiana.

To prevent the recording devices from freezing, an insulated house is built covering all pertinent parts of the meter run—meter, orifice flange, etc. The shelter consists of an inner veneer structure and an outer frame covering with a 2-in. layer of asbestos cement filling the void.

A door with a glass observation window is included in the shelter.

The shelter serves to protect the meter run from the cold winter winds, while the insulation retains the heat of the well stream during its pass through the run.

STILL used for contaminated oil.

Improvised still runs waste lean oil

A PLANT-FABRICATED still is being used at Arkla Oil Co.'s gasoline plant in Miller County, Southwest Arkansas, for the rerunning of slop oil and contaminated lean oil.

A heater has been made using heavy tubing and return bends for carrying the charge stock, with a gas burner located in the firebox as the heating medium. Firebrick was used to build up the firebox structure around the tubes.

Heated stock is carried into a tower made up from a joint of 30-in. pipe, swaged at the top and equipped with an appropriate safety valve. Several trays were welded within the tower so that better separation will be effected. Unrecoverable stock is taken off the bottoms and dumped, while recovered oil is pulled off the tower and used as product or makeup oil in the system.

The improvised tower is shown in the illustration just behind the fire box and is connected with heavy tubing. Notice how firebrick were placed around the tubes to insure adequate heating. The plant-fabricated still could be used at any gasoline plant and material can be salvaged from most any used pipe of adequate size.

by W. L. Nelson
Technical Editor

QUESTIONS ON TECHNOLOGY

Composition of Gases in Catalytic Reforming

What is the composition of the gases produced in catalytic reforming?—S. Wm. G.

The gas composition varies widely depending on the extent to which each of the several reactions is occurring and upon the chemical nature of the charge stock. Accordingly, only the approximation indicated in Table 1 can be suggested. The analyses for oils from various regions cannot be compared in Table 1 because the operating conditions, etc., were not the same. An average butane-free gas has the following composition and properties:

Hydrogen, per cent	80.8
Methane, per cent	5.0
Ethane, per cent	4.9
Propane, per cent	9.3
Mol. weight	8.0
Density, lb. per cu. ft. at 60° F.	0.021
Heating value:	
Gross	641
Net	569
At zero per cent excess air:	
Cu. ft. air per cu. ft. fuel	5.47
Per cent CO_2 (Orsat)	7.02

TABLE 1—COMPOSITIONS OF SOME BUTANE-FREE CATALYTIC REFORMING* GASES FROM THE LITERATURE
(Gas volume per cent)

	Hydrogen	Methane	Ethane	Propane
Mid-Continent:				
1	77.5	1.6	2.6	18.3
2	54.7	3.4	5.4	36.5
3	84.3	4.2	5.8	5.7
4	84.5	4.2	5.2	6.1
5	68.9	8.1	10.1	12.9
6	68.2	8.8	9.3	13.7
7	83.8	2.0	2.3	11.9
Pennsylvania:				
8	75.5	8.4	6.9	9.2
9	61.4	12.6	10.3	15.7
10	87.7	3.6	3.5	4.2
11	84.3	4.7	5.1	4.9
Kuwait:				
12	67.6	11.1	10.7	10.6
13	50.6	15.4	16.3	17.7
14	86.0	3.1	5.2	5.7
15	79.2	6.5	7.3	7.0
East Texas:				
16	93.7	1.3	0.8	4.2
17	91.2	1.7	1.3	5.8
18	90.2	1.0	1.4	7.4
19	92.7	0.7	1.0	5.6
West Texas:				
20	88.8	2.9	1.7	6.6
Venezuela:				
21	66.8	13.0	9.4	10.8
22	67.0	13.3	8.9	10.8
23	89.0	4.1	3.4	3.5
24	75.7	8.9	7.3	8.1
25	92.9	3.2	2.1	1.9
26	85.0	5.5	4.6	4.9
27	91.6	0.8	0.8	6.8
28	89.4	1.3	1.3	8.0
29	92.3	0.9	0.8	6.0
California:				
30	89.8	1.9	1.9	6.4
Gulf Coast:				
31	85.4	1.3	2.2	11.1
32	86.4	1.9	2.2	9.5
Avg. of all	80.8	5.0	4.9	9.3

*By platinum-catalyst processes.

References

1. Weber, George, The Oil and Gas Journal, April 6, 1950, p. 62.
2. Faulkner et al., The Oil and Gas Journal, November 24, 1952, p. 116.
3. Teter et al., The Oil and Gas Journal, October 12, 1953, p. 118.
4. Fowle et al., The Oil and Gas Journal, May 26, 1952, p. 181.

Cost of Dewaxing Plants

What would be the cost of two MEK dewaxing plants for the production of 300 long tons of semi-refined wax (1 per cent oil content) when feeding a high-wax-content feed stock (50 per cent wax) as compared to a feed containing only 20 per cent wax? What equipment is required and what would be the investment? H. J. Z.

Such detail is beyond the service of this department. It will be necessary to contact engineering contractors or a consultant. However, the general range of costs of dewaxing plants (mainly MEK) is indicated in Fig. 1. Very little information is available and some of the points on the figure date back to even 1934. All of the points shown on Fig. 1 have been converted to the year 1946 by the Nelson Refinery Construction Cost Index.

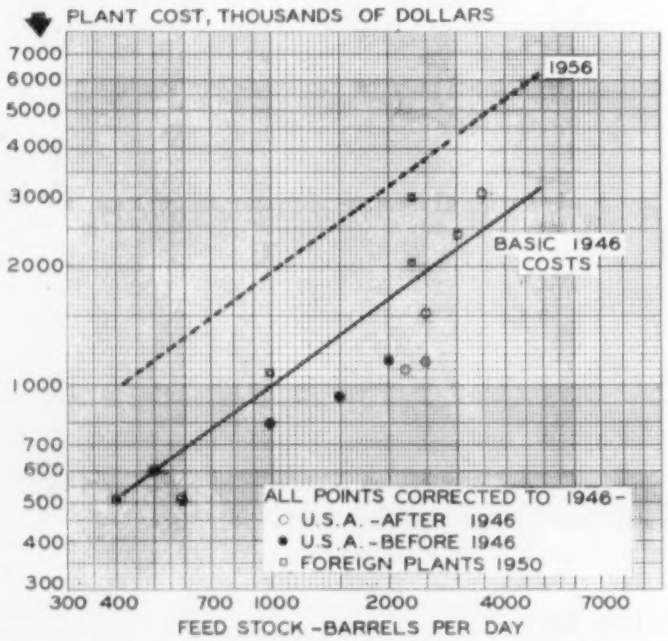


Fig. 1—Approximate costs of dewaxing plants, 1946 and 1956 (mainly MEK).

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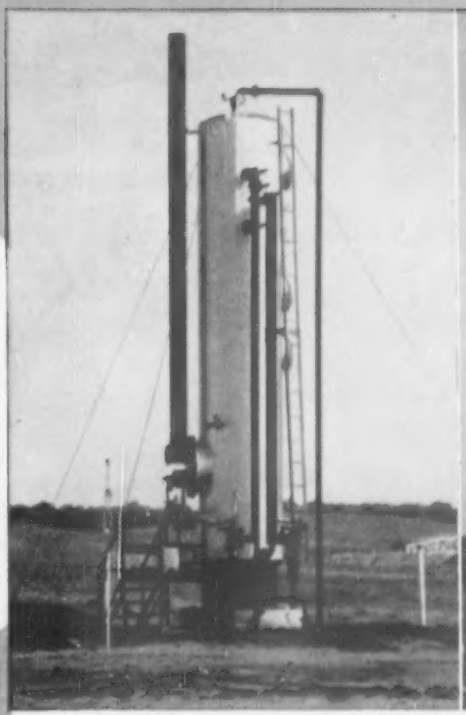
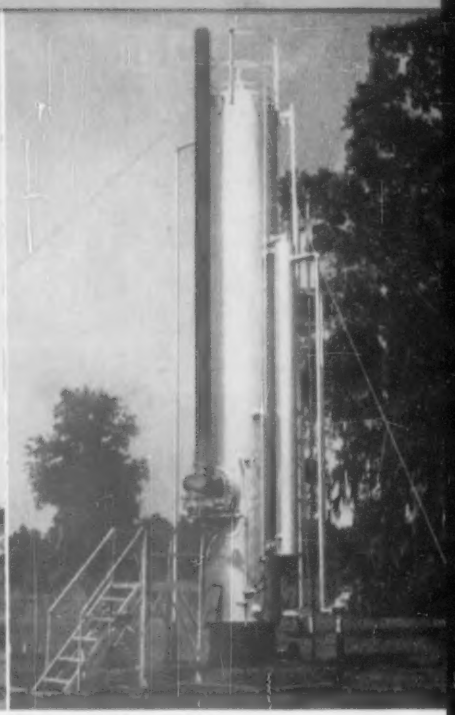


Type "S" The BS&B Type "S" Vertical Treater is a well balanced unit with excellent performance characteristics for low cost treating under average conditions. Available in sizes to treat 100 to 2500 bbls. of oil per day.



Type "J" The BS&B Type "J" Vertical Treater is a high performance level unit designed to handle large volumes of oil, water and gas on "tough" treating jobs. Available in sizes to treat 100 to 3600 bbls. of oil per day.

Model "HGT" Where a Horizontal Treater is indicated because of large volume requirements, broader distribution of weight on marshy ground, wind loading and anchoring conditions, etc. we strongly recommend the BS&B Model "HGT"." This treater will handle even the "toughest" treating jobs under the most adverse conditions. Available in sizes to treat 100 to 16,000 bbls. of oil per day.

Some makes and types of treaters operate at much higher efficiency than others under a given set of operating conditions. Some require a lot of expensive "down time" for maintenance and repairs. But lease operators of *experience* know that when they buy a BS&B Treater, they need have no concern on either count.

No matter how "average" or how "tough" the operating conditions on *your* lease, there's a right size and type of BS&B Treater for the job *you* have to do! BS&B Treaters are famous throughout the industry for their optimum operating results at lowest operating cost.

Don't be "shortchanged" by operating any treater on your lease that fails to deliver *maximum return per dollar invested!* Your BS&B Man will be glad to assist you in selecting the best treater for *your* conditions.

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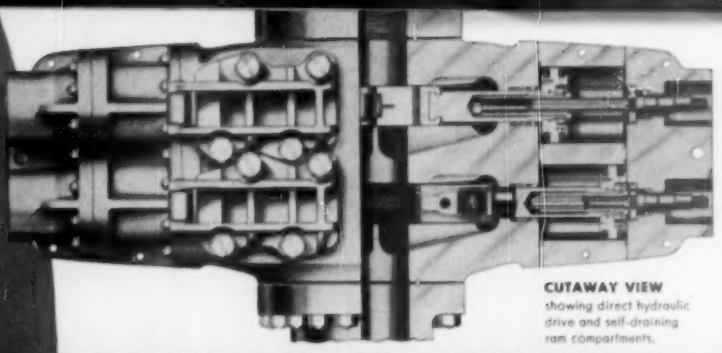
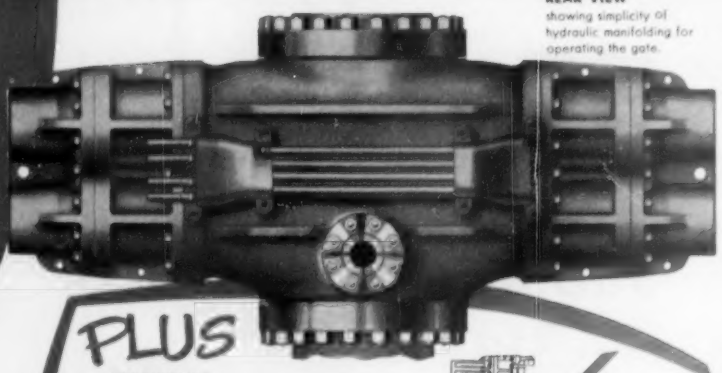


CUTAWAY VIEW
showing direct hydraulic drive and self-draining ram compartments.



REAR VIEW
showing simplicity of hydraulic manifolding for operating the gate.

...COMPACTNESS in a gate doesn't mean much if vital extra space must be allowed *above* the gate — or at the *ends* — in order to change rams. In Shaffer Hydraulic Gates the rams are changed through patented *side*-opening doors — doors that open across the *minimum* dimensions of the gate where there's plenty of space.

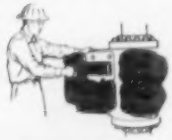
This means that the unusual compactness of Shaffer Gates is *completely useable* compactness. These gates fit into tight spaces too small to accommodate other equipment of comparable rating. Even in sizes as large as 13⅝" (12" Series 900) Shaffer *Double* Gates require a *total* height of only 30" — Single Gates only 18½" — with width and length dimensions also unusually compact.

But compactness is only *part* of the complete Shaffer story. Other vital advantages are outlined at right . . .

PLUS

...SAFETY!

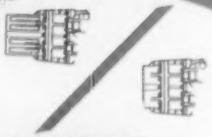
In Shaffer Gates you get field-proven pressure protection backed by the organization that pioneered cellar control gates more than three decades ago, and year after year has steadily maintained its leadership with one basic advancement after another!



...ACCESSIBILITY!

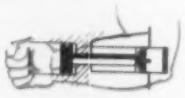
With Shaffer Hydraulic Gates, rams are changed by simply unbolting convenient *side* doors, sliding out the ram assembly, changing rams, replacing the assembly and bolting the doors shut. And closing the doors automatically aligns the rams within the body!

What's more, with Shaffer Double Gates, there's no need to dismantle the upper unit to change rams in the lower unit—or vice versa. Each is completely independent — each has its own convenient side-opening doors. And each can be changed with equal ease whether the pipe is *in* or *out* of the hole!



...SELECTION!

Shaffer not only provides a complete choice of sizes and ratings to meet every requirement, but also such additional choices as *Single* or *Double* Gates (the latter with *two* ram compartments unitized into *one* compact body) . . . each design with choice of *Rising* or *Non-Rising* Locking Shafts, depending upon whether you prefer the quick indication of ram position provided by a *Rising* Shaft, or the greater compactness of a *Non-Rising* Shaft. YOU pick the particular arrangement *you* prefer!



...DIRECT DRIVE!

In Shaffer Gates the operating pistons are *directly behind* the rams for positive operation, fewer parts, greater simplicity. There are no complicated hook-ups, no exposed piston rods, no secondary connections between operating cylinders and rams!

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See the Shaffer Section of your Composite Catalog!

ROCK-BIT DESIGN, SELECTION, AND EVALUATION—7

How Cross-Section Bit Cutters Are Designed

by H. G. Bentson

BASIC design criteria of cross-section bits embodies a consideration of bottom-hole coverage, cutter-shell thickness, and bearing configuration. A comparison of the cone and cross-section bit geometry makes it obvious that considerations related to tooth-to-tooth and tooth-to-groove clearances are not required.

The development of optimum bottom-hole coverage is simplified in the cross-section design since interfitting teeth are not used. Primarily this coverage is a matter of balance between the gage-cutter and cross-cutter lengths, with particular attention being paid to the danger of developing excessive radial space between the inner ends of the gage-cutter teeth and outer ends of the crosscutter teeth.

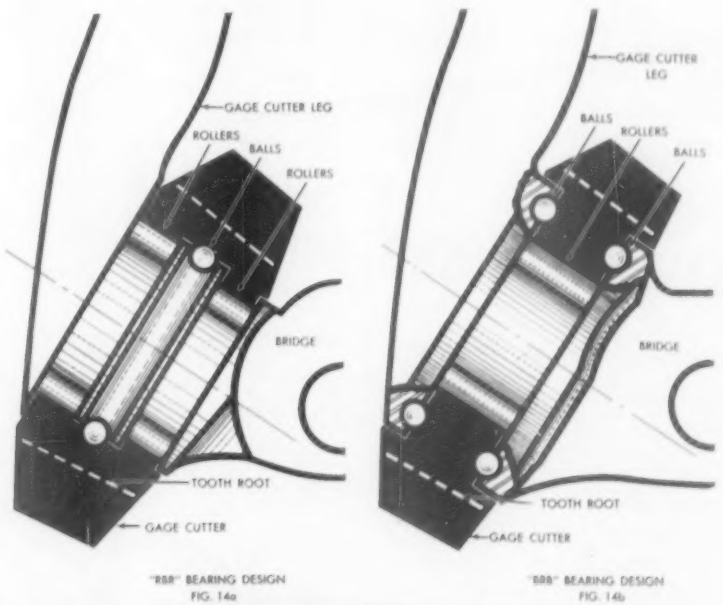
Author is chief sales engineer, H. C. Smith Tool Co., Compton, Calif.

Adequate cutter shell thickness in the cross-section bit is equal in importance to that in the cone bit. Once again, insufficient area in the structure will result in the loss of cutters and other parts in the hole.

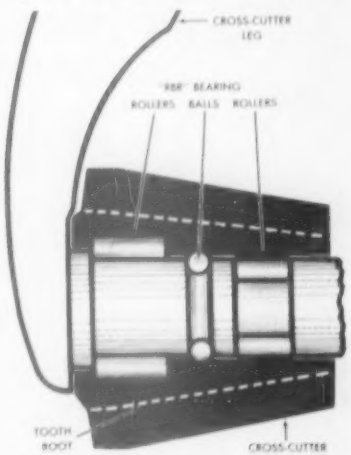
Obviously, due to variations in the physical size and shape of the cutters, bearing structure configuration for the gage-cutters must be different from that of the crosscutters. Gage-cutter bearing structures must be confined within a space comparatively short with respect to diameter. Conversely, the crosscutter bearing structure is restricted in diameter but permitted greater lattitude in longitudinal dimensions.

Two common types of gage-cutter bearing structures are shown in Fig. 14. The RBR type, Fig. 14a, is similar in basic configuration to the RBR type used in the cone bits. Here again, the design consists of an outer row of rollers, a row of balls, and an inner row of rollers. The BRB type in Fig. 14b utilizes two rows of balls for thrust loading and one row of rollers for radial loading.

Crosscutter bearing structures are commonly of the type presented by Fig. 15. This RBR or roller-ball-roller arrangement appears to be the type which is the most widely used.



CROSS-SECTION of a drilling bit. Common types of gage-cutter bearing structures. Fig. 14.



CROSS-SECTION showing a common type of crosscutter bearing structure. Fig. 15.

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Lake Chicot Plant Has Automatic Shutdown

by E. S. Wenger

THE Lake Chicot plant can be shut down automatically. For example, the heater is shut down when the exit oil temperature becomes abnormally high, when the stack temperature increases excessively, or when the pressure in the hot oil lines becomes too low. Also, the compressor is shut down when suction or discharge pressure exceed predetermined limits.

Operating History

Since completion, the Lake Chicot plant has processed 1¾ billion cubic feet of gas and has produced 50,000 bbl. of natural gasoline. Table 1 contains data to indicate how much production was lost because of downtime.

TABLE 1

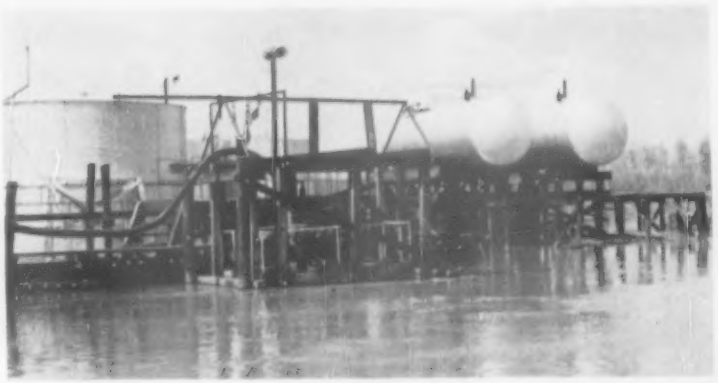
	1954	1955
Number of shutdowns exceeding 1 hour in duration	12	7
Total shutdown time in days	11.9	7.3
Per cent of gas unprocessed	3.3	2.4

Table 2 lists the reasons for shutdowns and the appropriate per cent of total down time attributable to each

TABLE 2

Cause of shutdown—	Per cent of total shutdown time
Repair water-pump barge	25.5
Repair water-pump and hose	16.1
Overhaul engines	13.2
Instrument and control failure	13.2
Compressor repairs	10.9
Annual inspection	6.2
Hydrate trouble	5.5
Replace corroded lines	5.2
Miscellaneous	4.2
Total	100.0

Author is with Amerada Petroleum Corp., Tulsa. Paper presented at N.G.A.A. annual meeting, Fort Worth, 1956.



LAKE CHICOT PLANT has processed 1¾ million cubic feet of gas since completion and has produced 50,000 bbl. of natural gasoline.

In reviewing the causes listed in Table 2, it is estimated that not more than half of the shutdown time could have been avoided with a larger operating force. The most significant factor controlling shutdowns is the absence of any standby equipment. This was done to cut costs.

Cooling-Tower Standards

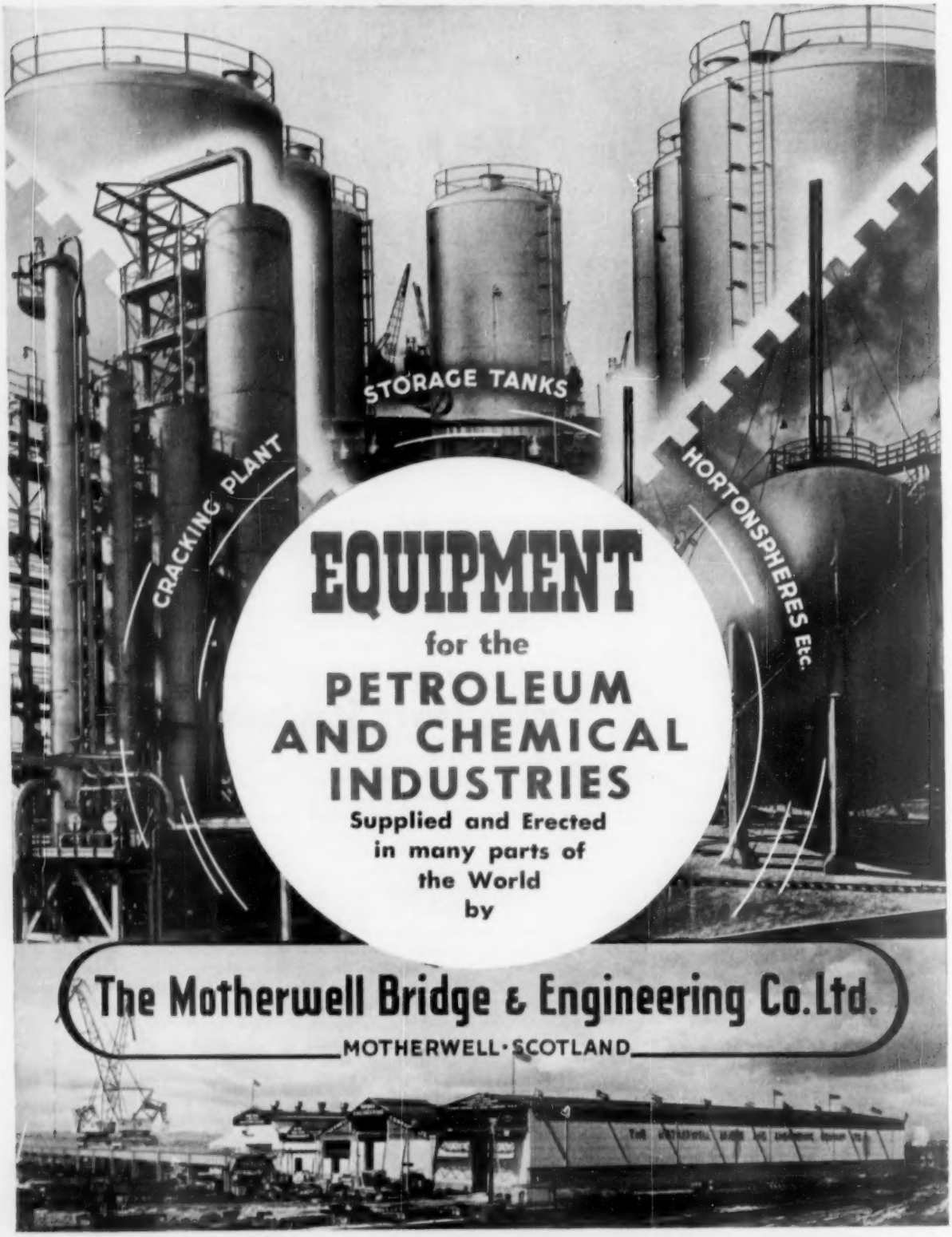
THE Cooling Tower Institute, Palo Alto, Calif., has available three publications of industrial standards for recommendation to purchasers and manufacturers of industrial water-cooling towers. These documents are the result of a 5-year program of research conducted by the technical committees of C.T.I.

A basic procedure for testing the water-cooling capability of any industrial tower is described in detail in the C.T.I. Bulletin A.T.P.-105 titled "C.T.I. Acceptance Test Procedure." Special grades of redwood lumber recommended by the Cooling Tower Institute for use in industrial towers are described in C.T.I. Bulletin Standard-101 titled "C.T.I. Grades of Redwood Lumber." Supplementing the specific grades is C.T.I. Bulletin Standard-102 on "Structural Design Data" in which design stress allowables are described for the C.T.I. grades of lumber.

Of particular interest to design engineers and users of industrial towers is the complete description of field-testing procedure which may be used either for determination of normal operating capacity of an installed tower or for determination of compliance with performance guarantees.

The mobile test unit assembled by C.T.I. and operated in the Gulf Coast area includes 12 portable electrical resistance-type psychrometer stations, each consisting of a wet-bulb and a dry-bulb temperature-sensitive element and a motor-powered blower designed to deliver air at a 1,000-ft. per minute velocity across the temperature-sensing elements. The essential elements of the investigation formed the basis for the recommendations described in the C.T.I. Bulletin A.T.P.-105.

In cooperation with the U. S. Forest Products Laboratory and the California Redwood Association, special cooling-tower grades of lumber were developed to permit more accurate selection of lumber for structural application in industrial towers.



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JOB IMPROVEMENT FOR THE PROCESS FOREMAN—68

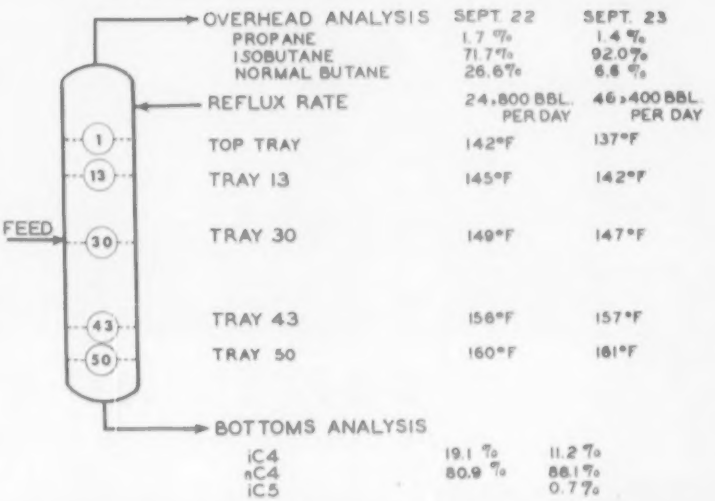
How Temperatures Affect Distillation Products

FOR design purposes, the top temperature for a given separation can be estimated by using the dew point of the overhead product. The dew point is defined as the temperature to which a vapor must be cooled in order that condensation will begin. This temperature is fundamentally related to the vapor pressure of the overhead product. For towers in light-hydrocarbon service, the tower-top temperature is usually 10°-40° F. higher than the reflux-drum temperature, provided the pressure in the drum is approximately equal to tower pressure. This differential is 60°-100° F.

Reboiler temperature . . . The reboiler temperature required for a given separation is the temperature at which the vapor pressure of the bottoms product is equal to tower pressure. Thus, for any given specification on the bottoms product, the vapor pressure and consequently reboiler temperatures are fixed. At a higher reboiler temperature, the vapor pressure of the bottoms will be increased above tower pressure such that a portion of the bottoms product will be vaporized and included in the overhead stream. If the reboiler temperature is reduced, the vapor pressure of the bottoms will be reduced below tower pressure with the result that light materials will condense in and contaminate the bottoms product. For example, choice of a reboiler temperature for a typical debutanizer would be based on this type of information:

Tower operating pressure, (psi.)	150
Vapor pressure of bottoms product °F.	(psi.)
100 (R.v.p.)	5
150	13
200	29
250	57
300	105
337	150
350	175
400	270

This material is taken from "Fundamentals of Refining," operating manual of Magnolia Petroleum Co., refining division, Beaumont, Tex.



EFFECT OF TEMPERATURE GRADIENT on product purity alkylation unit isobutane tower. Fig. 10.

Thus, in order to produce a stable gasoline with a specification of 5 R.v.p., a reboiler temperature of about 337° F. would be used.

Temperature gradient . . . The distribution of heavy and light hydrocarbons throughout a tower has been previously discussed. The reflux becomes progressively heavier as it passes downward through the tower and the vapor generated in the reboiler becomes lighter as it rises through the tower.

The heavy materials are thereby concentrated in the bottoms and the light materials in the overhead product. Starting from the bottom of the tower, the liquid on successive trays becomes increasingly lighter (i.e., the A.P.I. gravity increases). Since lighter materials boil at lower temperatures, the temperatures of the liquid on each tray are successively lower going up the tower.

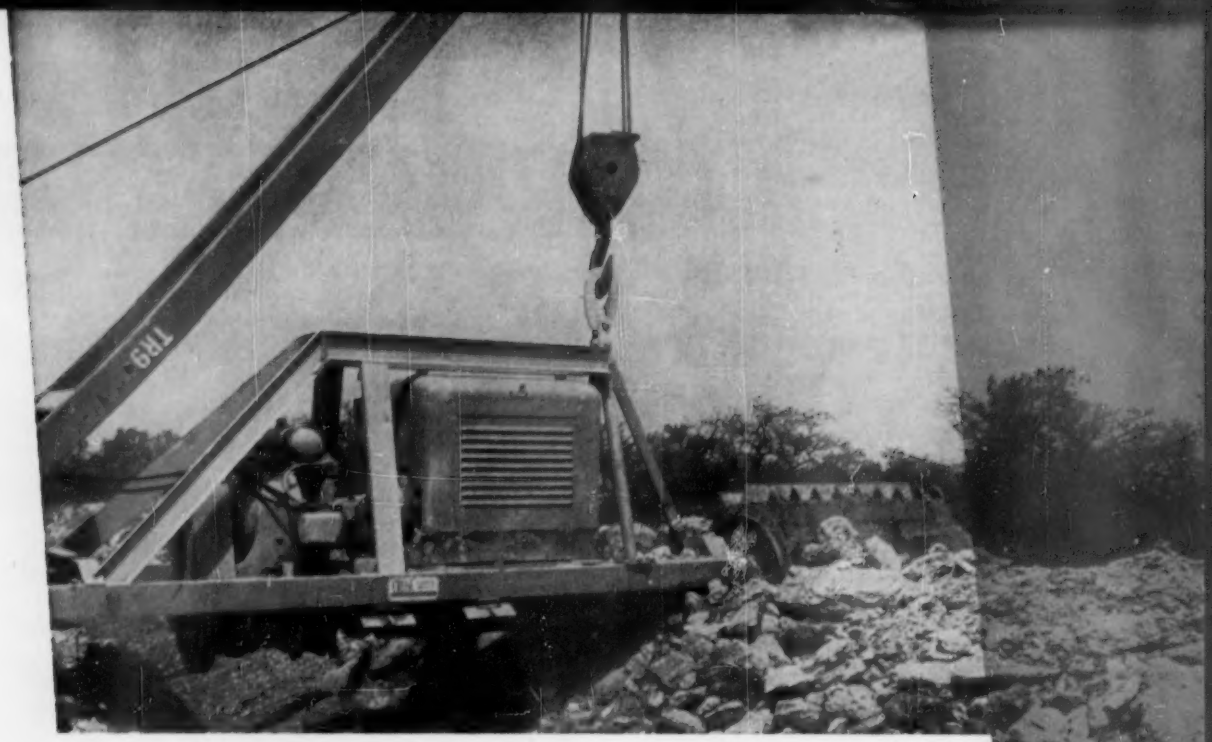
The temperature gradient is increased by applying heat at the bottom of the tower (with the reboiler), and cooling the top section of the tower (with reflux). The greater the quantity of reflux pumped back to the tower under stable operating conditions, the cooler will be the top trays and consequently the overhead product will be lighter. Also, as the quantity of heat put into the tower by the reboiler is increased, the bottoms temperature increases and the bottoms product becomes heavier.

The best possible product purity will, therefore, be achieved when the temperature gradient (as measured by the difference between the tower top and bottoms temperatures) is a maximum. This is accomplished by:

1. Maximum reboiler heat supply.
2. Maximum reflux rate.
3. Tower operation free from flooding.

Up to the point where too much reflux is pumped to the tower and flooding occurs, the temperature gradient and thus product purity improve as the liquid downflow in the tower is increased. This principle holds true for any factionating tower, but for purposes of illustration, a light-hydrocarbon distillation operation will be considered.

The effect of temperature gradient on product purity for the isobutane tower at the alkylation unit is shown in Fig. 10.



SOFTENING UP

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Pipeline Patrol

. . . Report on Construction

Under Way, Contracted, and Planned

PIPELINE activity reported here is compiled from surveys conducted by The Oil and Gas Journal among pipeline companies and contracting firms. Projects listed include those proposed, contracted, and under way. Uncontracted projects are indicated by • preceding the project.

Crude-Oil Pipelines

Fulton, R. H. & Co., Lubbock, Tex.
Project: 20 miles of 6-in. from Donkey Creek field near Moorcroft, Wyo., to Butte Pipe Line Co.'s line.
Status: Fulton, a contractor, has applied to Wyoming Public Service Commission. Application competes with that of Powder River Pipeline Co.

• **Humble Pipe Line Co.**
Project: 94 miles of 18-in. from Ector County to Kemper County, Texas.
Completion: February 1, 1957.

• **Interstate Oil Pipe Line Co.**
Project: 5 miles of 4-in. from South Bosco field, Louisiana, to present main line, and 5 miles of various size from Church Point field, Louisiana, to present main line.
Status: Proposed.
Project: 5 miles of 8-in. from McKamie Station to Magnolia Station, Arkansas.
Status: Under way.
Contractor: **J. C. Moore Construction Co.**
Project: 16 miles of 12-in. from Pelican Island to Lake Washington, Louisiana.
Status: Under way.
Contractor: **Glaser Construction Co., Inc.**
Completion: November 20, 1956.

• **Magnolia Pipeline Co.**
Project: 36 miles of 12-in. from Andrews to Midland, Tex.
Status: Under way.
Contractor: **H. B. Zachry Co.**
Completion: November 15, 1956.

Northwest Pipeline Corp. (an affiliate of Pacific Northwest Pipeline Corp.)
Project: 350 miles of 8-in. crude and products line from Four Corners area to Salt Lake City.
Completion: August 1957.

• **Offshore Gathering Corp.,** Houston.
Project: 364 miles of mostly 20-in. in Gulf of Mexico off Louisiana.
Status: Pending FPC approval.

Ohio Oil Co.
Project: 504 miles of 8-in. from Teutopolis, Ill., to Spitzmesser, Ind.
Contractor: **O. R. Burden Construction Corp.,** F. W. Lewis, spread superintendent with office at Sheridan, Ind.; P. E. Thibodaux, spread superintendent with office at Rockville, Ind.

• **Pasotex Pipe Line Co.**
Project: 127 miles of 20-in. along its route from Wink to El Paso, retiring another dual 8-in. section.
Status: Planned.
Completion: July 31, 1957.

• **Powder River Pipeline Co.,** Fratt Building, Billings, Mont.
Project: 20 miles of 6-in. from Donkey Creek field near Moorcroft, Wyo., to Butte Pipe Line Co.'s line. (See Fulton, R. H. & Co., above.)
Status: Planned.

• **Service Pipeline Co.**
Project: 30 miles of 3, 4, 6-in. to connect 16 new leases in Antelope, Charlson, Sanish, and Blue Buttes pool in McKenzie County, North Dakota, to its present gathering system.
Status: Planned .
Project: 5 miles of 12-in. near El Dorado, Ark.
Contractor: **O. R. Burden Construction Corp.,** R. M. Jones, spread superintendent, office at El Dorado.

• **Shannon Oil Co.,** Denver.
Project: 34 miles of 6-in. from Murphy dome in Hot Springs County, Wyoming, to contact Ohio Oil Co.'s line in Big Horn County. Joint project with Farmers Union Central Exchange, Inc., and Mule Creek Oil Co., both of Billings, Mont.
Status: Under way.
Completion: December 1, 1956.

Shell Pipe Line Corp.
Project: 42 miles of 20-in. from Shell's Houston refinery to Brookshire Station.
Status: Under way.
Contractor: **Bill Murry & Co.;** Bill Murry spread superintendent, office 12629 South Main Street, Houston.
Completion: December 1, 1956.

• **Sinclair Pipeline Co.**
Project: 150 miles of 20-in. from Teague, Tex., to Houston.
Status: Planned.
Completion: 1957.

• **Tecumseh Pipe Line System**
Project: 190 miles of 20-in. between East Chicago and Cygnet, Ohio. Joint project with Sinclair Refining Co., Pure Oil Co., Ashland Oil & Refining Co.
Status: Planned.
Completion: September 1957.

• **Union Oil Co. of California.**
Project: 225 miles of 16-in. from San Joaquin Valley to its refinery at Oleum, Calif.
Satus: Planned.
Completion: Late 1957.

Products Pipelines

• **American Pipe Line Co.**
Project: Line from Gulf Coast to New York City area. Received ODM approval to amortize 40 per cent of $175,000,000 cost with a rapid writeoff.
Status: Planned.

• **El Paso Natural Gas Co.**
Project: 240 miles of "larger than 6-in." to carry natural gasoline, butane, and propane from its Midkiff natural-gasoline plant in Permian basin, Midland County, Texas, to El Paso.
Status: Planned.
Project: 38 miles of 4-in. from Wingate, N. M., to Prewitt refinery.
Status: Under way.

• **Gulf Refining Co.**
Project: 45 miles of 8-in. from Pontiac Eastern Corp.'s planned refinery at Hattiesburg, Miss., (due on stream May 1957) to a connection with Plantation Pipe Line Co.'s system.

Magnolia Pipe Line Co.
Project: 30 miles of 8-in. LPG from Andrews to Dollarhide, Tex.
Status: Under way.
Contractor: **H. B. Zachry Co.**
Completion: November 1, 1956.

• **Northwest Pipeline Corp.** (an affiliate of Pacific Northwest Pipeline Corp.)

Write for Bulletin

PIPELINE VENTS AND MARKERS

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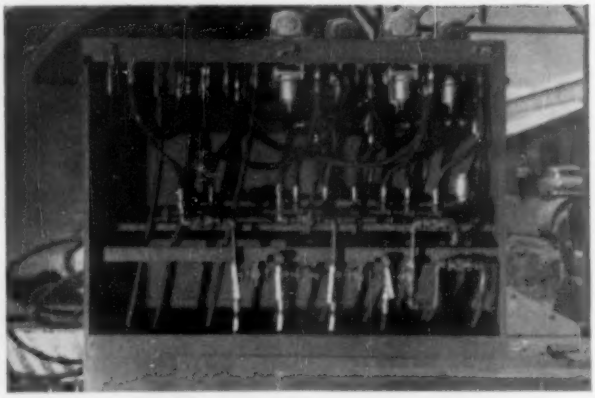

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Pipeline Patrol

Project: 80 miles of 8-in. and 300 miles of 10-in. products and crude line from Four Corners area to Salt Lake City.
Status: To start May 1957.
Completion: August 1957.

Phillips Petroleum Co.
Project: 66 miles of 12-in. from Borger, Tex., to Cassoday, Kan.
Status: Work started late October 1956.
Contractor: **Vedal Construction Co.**

• **Phillips Pipe Line Co.**
Project: 135 miles of 12-in. looping between Borger, Tex., and St. Louis.
Completion: December 31, 1956.

Plantation Pipe Line Co.
Project: 327 miles of 18-in. from Baton Rouge, La., to Helena, Ala.
Status: Under way.
Contractor: **Oklahoma Pipe Line Constructors;** N. L. Arie, spread man, office at Baton Rouge.
Completion, December 1956.

Standard Oil Co. (Ohio)
Project: 37 miles of 8-in. from Mogadore to Girard, Ohio.
Status: Under way.
Contractor: **Somerville Construction Co.**
Completion: November 24, 1956.

• **Pure Transportation Co.**
Project: 8 miles of 10-in. from Smiths Bluff to Port Arthur Station of Evangeline Pipe Line System.
Status: To start December 1, 1956.
Completion: January 15, 1957.

• **Sioux Oil Co.**
Project: 80 miles of 4-in. from its Newcastle, Wyo., refinery to Rapid City, S. D.
Status: Planned.
Completion: Late 1956.

• **Southern Pacific Pipe Lines, Inc.**
Project: 300 miles of 6, 8, 10-in. to span the Sierras and connect San Francisco with Reno and Fallon, Nev., and to serve the Sacramento Valley.
Status: Planned.
Completion: August 1, 1957.

• **Union Oil Co. of California**
Project: 815-mile line from Rifle, Colo., to Los Angeles refining area, to carry products from its proposed Rifle shale-oil plant.
Status: Proposed.

Non-Petroleum Pipelines

American Gilsonite Co.
Project: 70 miles of 6-in. from Bonanza, Utah, to Grand Junction, Colo., to carry slurry of gilsonite from mines to refinery now being built.
Status: Under way.
Contractor: **Engineers Limited Pipe Line Co.**
Completion: Late 1956.

Dow Chemical Co.
Project: 16 miles of 4-8-in. brine lines.
Contractor: **Shamrock Construction Co.**
Completion: December 1956.

Natural-Gas Pipelines

• **Arkansas Louisiana Gas Co.**
Project: Line from Texas-Louisiana coastal region to northern Louisiana, to connect with their present system.
Status: Long-range plans.

Atlantic Seabord Corp.
Project: 50 miles of 24-in. from Hardy County, West Virginia, to Greene County, Virginia, and 32 miles of 26-in. loops along the Cobb-Rockville line in West Virginia.
Status: Under way.
Contractor: **Williams - Austin Co.;** O. L. Martin, spread man on the 50-mile, 24-in. section, office at Elkton, Va.; Ralph Gaddy, spread man on the 32-mile, 26-in. looping, office at Elkins, W. Va.
Completion: November 1, 1956.

• **Carolina Pipeline Co.**
Project: Distribution lines to serve 14 cities in Central South Carolina. Will buy gas from Transcontinental Gas Pipeline Co. or Southern Natural Gas Co.
Status: Has received South Carolina Public Service Commission permit.

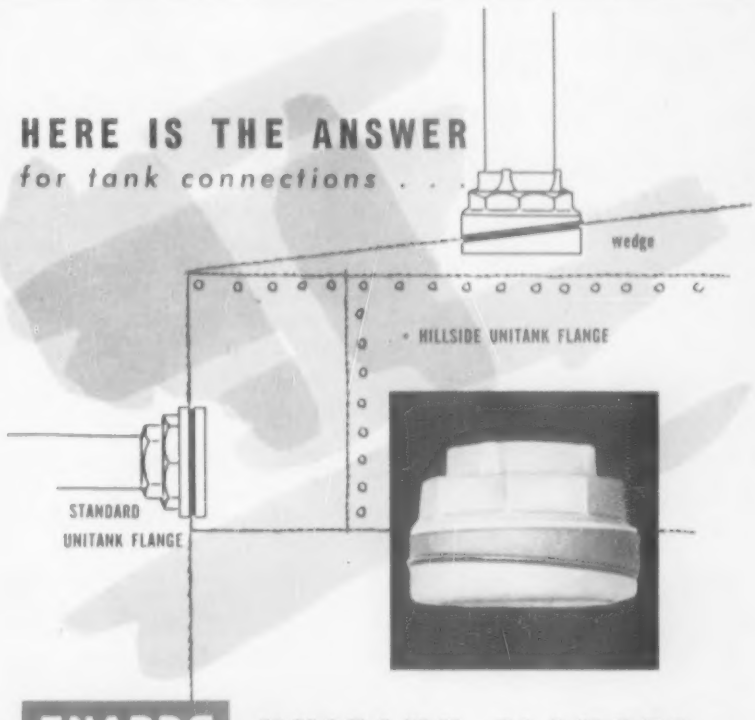
Cities Service Gas Co.
Project: 17 miles of 20-in. loops from Edmond, Okla., to the Cimarron River.
Status: Under way.
Contractor: **R. H. Fulton & Co.**
Completion: October 31, 1956.
Project: 9 miles of 16-in. and 4 miles of 8-in. near Springfield, Mo.
Status: Approved.
Contractor: **Prairie Construction Co.**
Completion: November 30, 1956.

• **Cities Service Pipe Line Co.**
Project: 27 miles of 6-in. from Lake Charles, La., to Orange, Tex.
Status: Planned.
Completion: April 30, 1957.

• **Coastal Transmission Corp.**
Project: 565 miles of 22-26-in. from McAllen, Tex., to Baton Rouge, to deliver to Houston Texas Gas & Oil Co.'s proposed line to Florida. Also 272 miles of smaller gathering lines.
Status: Seeks FPC permit.

• **Colonial Natural Gas Corp.**
Project: Two systems; one between Houston-Lake Charles area and Miami, Fla.; one in the Carolinas and Georgia.
Status: Proposed.

• **Colorado Interstate Gas Co.**
Project: 238 miles of 22-in. from Laramie to Green River, Wyo. (last part of a 374-mile line between Denver and Rock Springs).
Status: Under way.
Contractor: **R. H. Fulton.**
Completion: January 1957.



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The ENARDO Unitank Flanges are made to fit either flat decks (Standard) or sloping decks (Hillside). They are cast of sturdy metal, precision machined, easily installed, and economical because of labor saved at installation. The "Hillside" flange consists of a body, wedge, and retaining nut, designed for connections on the slope of standard tank decks. This flange keeps all overhead piping vertical. Not at an unknown angle, i.e. a standard flange on sloping deck. (See illustration.) The "Standard" flange consists of a body and retaining nut. It is designed for installation on all tank walls. On both type flanges, body extends through tank plate from the inside with gasket between body and plate. Retaining nut is tightened from outside (see illustration). Left-hand threads are machined on both body and retaining nut; this causes the flange to tighten instead of loosen when receiving standard pipe, from either the inside or outside. Only one hole needed for "Hillside" or "Standard" flanged installation. Both flanges have had universal acceptance in the oil fields.

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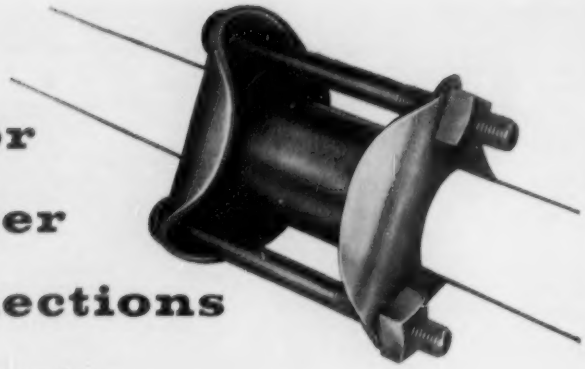

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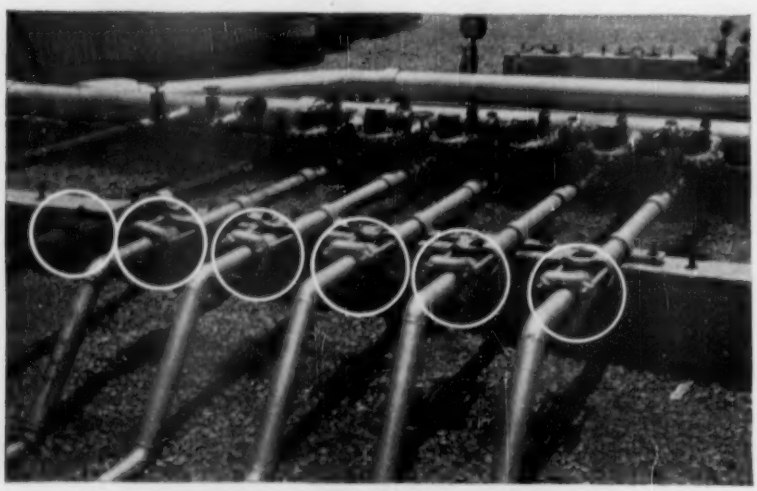

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Hydropak® Asbestos Cement Pipe Clamp

Style 63 Expansion Joint

Style 39 Insulating Coupling

Pipeline Patrol

Project: 26 miles of 8-in. loops at Cannon City, Colo.
Status: Planned.
Completion: December 1, 1956.

Project: 1957 program . . . 66 miles of 30-in., 40 miles of 34-in., 109 miles of 26-in., and 100 miles of 24-in. from Springfield, Colo., to Pueblo, Colo; 345 miles of 30-in. from Kit Carson, Colo., to Beatrice, Neb.; 50 miles of 22-in. from Laverne to Hooker, Okla.; 24 miles of 22-in. Panhandle field looping.
Status: Pending FPC approval.

Commonwealth Natural Gas Corp.

Project: 40 miles of 18-in. looping from Gum Springs to Chester, Va.
Status: Under way.
Contractor: **Pipeline Maintenance & Construction Co.**
Completion: January 15, 1957.

El Paso Natural Gas Co.

Project: 193 miles of 34-in. between San Juan basin and Topock, Ariz., and 38 miles of 20-in. between San Juan mainline and Phoenix.
Status: Under way.
Contractor: Doing own construction.
Completion: February 1, 1957.

Project: 146 miles of 34-in. between San Juan basin and Topock.
Contractor: **Western Pipeline, Inc.**
Completion: February 1, 1957.

Project: 112 miles of 20-in. between San Juan mainline and Phoenix.
Status: Under way.
Contractor: **Western Pipeline, Inc.**
Completion: November 1, 1956.

Project: 888 miles of field and main lines in Texas, New Mexico, and Arizona.
Status: Filed June 1956 for FPC permit.

Project: 28 miles of 10-in. in Nolan and Coke counties, Texas.
Satus: Has FPC permit.

Hope Natural Gas Co.

Project: 22 miles of 8-in. in Logan County, West Virginia, and 20 miles of 3 to 8-in. in various West Virginia counties.
Status: Under way.
Contractor: **R & M Pipelines, Inc.**, Charleston, W. Va.
Completion: Late 1956.

• **Houston Texas Gas & Oil Co.**

Project: 960 miles between Baton Rouge, La., and Miami, Fla.: 507 miles of 30-in., 157 miles of 26-in., 61 miles of 20-in., 224 miles of 12-in., plus 500 miles of sales laterals in Florida, with main line joining Coastal Transmission's proposed line from McAllen, Tex., to Baton Rouge.
Status: Pending FPC approval.

• **Iron Ranges Natural Gas Co.**, St. Paul.

Project: 68-mile transmission line and 47 miles of laterals to supply towns on the Mesabi Iron Range, Minn.
Status: Application pending with FPC.

• **Kansas-Nebraska Natural Gas Co., Inc.**

Project: 10 miles of 10-in. and 10 miles of 8-in. from Grand Island to Albion, Neb.
Status: Planned.
Completion: November 1956.

Project: 27 miles of 12-in. from Camrick field to Liberal, Kans.
Status: Pending FPC approval.
Completion: November 1956.

Project: 11 miles of 12-in. from Scott City to Oakley, Kans., to replace equal quantity of 8-in.
Status: Has FPC permit.
Completion: December 1956.

• **Lone Star Gas Co.**

Project: 230-mile line from Cotton County, Oklahoma, to Fritch, Tex., and a 205-mile line from Snyder, Tex., to hook up with the Cotton-Fritch line. Being contested by Natural Gas Pipeline Co. of America.
Status: Application pending with FPC.

IT'S REVOLUTIONARY

FOR METERING, TESTING SAMPLING, MANIFOLDING

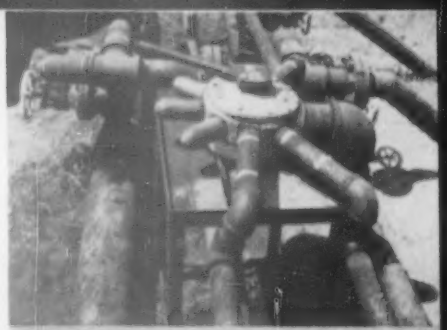
Win Well 7-WAY

MULTI-PORT ROTARY SELECTOR VALVE

Brings as many as 7 different Pipe Lines to a central source

The Win-Well Selector Valve has caused a "minor revolution" in the thinking of engineers who are concerned with the control of bulk liquid flow, and it has enabled them to make radical changes in testing, metering and sampling — changes that have meant great economies.

Win-Well is a rotary valve with 9 ports adapted to connect as many as 7 input lines to a single output line, and one auxiliary output line. For instance, any one of the input lines can be connected with the auxiliary output line as oil is being joined into a common supply line for transmission to storage tanks or other locations.

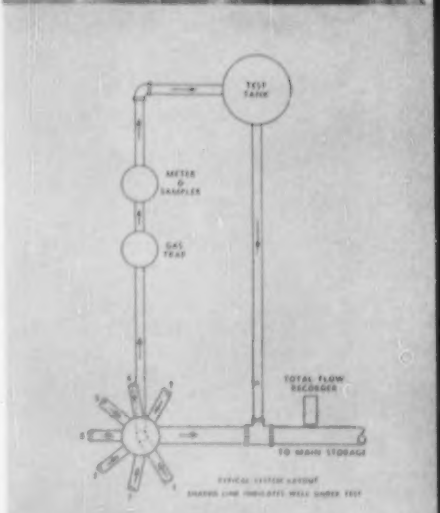


TEFLON BUSHINGS MEAN TROUBLE-FREE OPERATION

With only one moving part — the rotating element or selector body — the bearing surfaces at the top and bottom of the selector, as well as the face that seats against the port faces of the Win-Well Valve, are made of Teflon — highly resistant to abrasion, corrosion and maximum high and low temperatures. Win-Well's unique design effects extremely tight seals *with no leakage,* even under low pressure service. (Service rating: 150# Valve — Non-shock rating continues flow of water, oil or gas — 600#)

A MUST FOR OIL PRODUCTION AUTOMATION

The adaptability and application of the Win-Well Valve to systems of automation in oil production are limitless. Electric controls, especially designed for automation, are available from Win-Well, and similar systems have been developed for pneumatic and gas controls — offering an immediate and practical solution to automatic fluid control.



FIELD TESTED AND PROVED

After 8 months operation in the field, under the most demanding conditions, the Win-Well Valve underwent rigid, microscopic laboratory tests. The report of these tests proved Win-Well's rugged dependability, a copy of the report is available to you upon request.

A Win-Well representative will gladly discuss the valve's potential for your fluid control use.

Win Well Manufacturing Company

8460 West Third St. Los Angeles 48, Calif.

Pipeline Patrol

Michigan Consolidated Gas Co.
Project: 67 miles of 10 and 12-in. between Sears and Travers City, Mich.
Status: Under way.
Contractor: **Somerville Construction Co.;** Floyd Huduall, spread superintendent, office at Cadillac, Mich.
Project: 60 miles of 10 and 12-in. between Muskegon and Ludington, Mich.
Status: Under way.
Contractor: **Somerville Construction Co.,** jointly with **J. L. Gentry Construction;** Frank Morris, spread superintendent, office at Hart, Mich.

• **Michigan Wisconsin Pipe Line Co.**
Project: 142 miles of loops in Wisconsin and Illinois.
Status: Under way.
Contractors: **H. C. Price Co.** and **Houston Contracting Co.** Price will build 56 miles of 24-in., and Houston will build 42 miles of 20-in. and 51 miles of 16-in. (being handled by Latex Construction Co. of Georgia), spread office at Fond du Lac, Wis.
Project: 40 miles of 6, 4-in. looping in Wisconsin.
Status: Under way.
Contractor: **G. E. T. Construction Co.**
Completion: November 1956.
Project: 47 miles of 6, 4-in. looping in Iowa and Missouri.
Status: Under way.
Contractor: **Gabe's Construction Co.**
Completion: November 1956.
Project: 31 miles of 6, 4-in. new and loop lines in Michigan and Indiana, and 24 miles of 24-in. looping in Wisconsin.
Status: Has FPC permit.
Completion: 1957.

• **Midwestern Gas Transmission Co.**
Project: Will build main line from Portland, Tenn., to Canadian border near Emerson, Man.; 829 miles of 24-in., 109 miles of 16-in., 174 miles of 12-in., 648 miles of 3 to 18-in. extensions in Minnesota and Wisconsin.
Status: Application pending with FPC.

Montana-Dakota Utilities Co.
Project: 28 miles of 12-in. from Fallon County to Dawson County, Montana.
Status: Under way.
Contractor: **Ross Powers Construction Co.,** Billings, Mont.

Montana Power Co.
Project: 75 miles of 6-in. from Big Coulee field to Lewiston and Harlowton, Mont.
Status: Under way.
Contractor: **O'Connor Construction Co.,** Fromberg, Mont.
Completion: November 15, 1956.

• **Mountain Fuel Supply Co.,** Salt Lake City.
Project: 38 miles of line to connect with Pacific Northwest Pipeline Corp.'s system in Sweetwater County, Wyoming.
Status: Has temporary FPC permit.

• **Natural Gas Pipeline Co. of America**
Project: 350 miles of 20 and 26-in. from Jack and Wise counties, Texas, to Fritch, Tex., which is being contested by Lone Star Gas Co.
Status: Has FPC approval.
Project: 389 miles of 36-in. loops along its line from Beatrice, Neb., to Chicago, to take gas from proposed line of Colorado Interstate Gas Co., and for 91 miles of 30-in. loops along parts of its main line.
Status: Application pending with FPC.

Niagara Mohawk Power Corp.
Project: 272 miles of 2 to 12-in. distribution mains for growth of service area in central, eastern, and northern New York.
Status: Fifty per cent completed.
Contractors: Various.
Completion: December 31, 1956.

• **North Carolina Natural Gas Corp.** (Subsidary of Colonial Natural Gas Corp.)
Project: 575 miles of 3 to 16-in. from Transcontinental Gas Pipe Line Corp.'s system near Mooresville, eastwardly across north Carolina.
Status: Has permit from North Carolina Utilities Commission.

• **Northern Natural Gas Co.**
Project: 11 miles of 16-in., 81 miles of 12-in., 71 miles of 10-in. from Sioux Falls, S. D., to Aberdeen, S. D.
Status: Under way.
Contractor: **R. H. Fulton & Co.**
Project: 160 miles of 2, 3, 6, 8-in. branch lines to serve 20 new communities on Aberdeen, S. D., line.
Status: Under way.
Contractor: **Troth Construction Co.**
Project: 15 miles of 24-in. looping north and south of Hooper, Neb.
Status: Under way.
Contractor: **R. H. Fulton & Co.**
Project: 8 miles of various size branch lines to serve 8 new communities in Iowa.
Status: Under way.
Contractor: **Underground Constructors, Inc.**
Project: 73 miles of 20-in. from Savana Creek to Pincher Creek fields in Alberta, Canada; 32 miles of 24-in. from Pincher Creek to Montana border; 1,100 miles of 26-in. from Montana into Minneapolis.
Status: Planned.

• **Offshore Gathering Corp.,** Houston.
Project: 364 miles in Gulf of Mexico off Louisiana.; 60 miles of 24-in., 70 miles of 26-in., 234 miles of 30-in.
Status: Application pending with FPC.

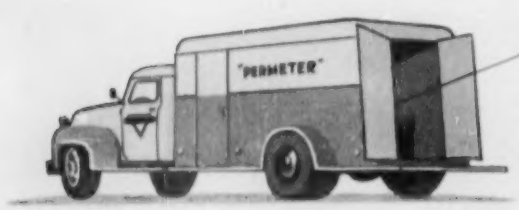
• **Pacific Gas & Electric Co.**
Project: 37 miles of 20-in., 37 miles of 18-in. 9 miles of 12-in. from Beehive Bend field

CPC OPEN HOLE CALIPER

▼ Open hole calipering is a quick and economical method of obtaining valuable well data when there is a possibility of hole enlargement in old wells on which there are no records readily available, in flood wells, or producing wells that have been acidized, fractured, or shot.

A CPC Open Hole Caliper Survey affords a reliable, accurate means of gauging the hole size prior to setting open hole packers, plugging back, or other remedial operations. The instrument is small enough to be run through open-end 2" tubing, and the motor-driven measuring arms can be extended or retracted as desired to permit repeated runs without coming out of the hole. Accuracy of the tool is ¼" within a span of 2" to 32" hole diameter. The recorder mechanism used with the caliper plots a graph directly on a linear chart so that the caliper log data can be compared with radioactivity logs or electric logs.

Open Hole Calipering is one of several outstanding Permeter Service operations available through The Chemical Process Company. Further information will be furnished without obligation by your nearest Chemical Process Company station, or write to us at P. O. Box 831 in Breckenridge, Texas. We will be glad to send you complete details and illustrated literature without obligation.



THE CHEMICAL PROCESS COMPANY

Pipeline Patrol

near Willows, Calif., to near Davis, then to Sacramento.

Status: Planned.

Project: 135 miles of 34-in. looping of the Topock-Milpitas line.

Status: Under way.

Contractor: A joint-venture firm, **Midwestern-Johnson-Dixon,** has 85 miles to complete this year.

Completion: Major part to be laid in 1956; 62 miles in 1957.

Project: 200 miles of 12-in. from Sacramento Valley gas fields to Humboldt County, California.

Status: Has filed for approval of California's Public Utilities Commission.

• **Pacific Northwest Pipeline Corp.**

Project: 37 miles of 6-in. from Dove Creek Nucla, Colo., and 13 miles of 4-in. from Nucla to Urvan, to serve Union Carbide Nuclear Co. and Vanadium Corp. of America.

Status: Has FPC permit.

Project: 156 miles of 20 and 16-in. laterals from main line to Spokane, and 129 miles of laterals into Idaho.

Status: Under way.

Contractor: **R. H. Fulton & Co.**

Completion: Fall 1956.

• **Panhandle Eastern Pipe Line Co.**

Project: 82 miles of 4 to 12-in. gathering lines.

Status: Proposed. Bids have been requested.

Completion: December 31, 1956.

• **Peoples Natural Gas Co.**

Project: 4 miles of 12-in. from Evans City to Harmony, Pa.

Status: Planned. FPC permit not required.

Completion: January 1, 1957.

Project: 4 miles of 8-in. field line in Westmoreland County, Pennsylvania.

Status: Planned. FPC permit not required.

Completion: November 15, 1956.

Permian Basin Pipeline Co.

Project: 19 miles of 16-in. in Andrews, Tex.

Contractor: **R. H. Fulton & Co.**

• **Phillips Petroleum Co.**

Project: 14 miles of 2 to 10-in. in Carson County, Texas.

Completion: December 1, 1956.

Project: 54 miles of 2 to 10-in. in Hutchinson County, Texas.

Completion: January 1, 1957.

• **Piedmont Gas Co.,** Hickory, N. C. (Parent is Carolina Natural Gas Corp.)

Project: 78 miles of 2 to 8-in. extension off Trancontinental in North Carolina to serve Gaston, Lincoln, Catawba, Caldwell, and Burke counties.

Status: Application pending with FPC.

Southern California Gas Co. and Southern Gas Co. of California

Project: 241 miles of 30-in. from the outskirts of Los Angeles to Topock on the Arizona-California border.

Status: Right-of-way and ditch under way; pipe laying begins in January, 1957.

Contractor: **R. H. Fulton & Co.**

Completion: June 30, 1957.

Project: 49 miles of 30-in. from Newhall to Alhambra, Calif.

Status: Under way.

Contractor: **Joe E. Young Contractors, Inc.,** has 19 miles from Encino to Newhall, Calif. **Macco Corp.** has 16 miles from Encino to Glendale, Calif. **Alex Robertson Co.** has 14 miles from Glendale to Alhambra, Calif.

Completion: December 1, 1956.

Spokane Natural Gas Co.

Project: 400 miles of 1 through 24-in. distribution system at Spokane.

Status: Under way.

Contractor: **Hallmac Construction Co.**; V. L. Williams, spread superintendent, office at Spokane.

Completion: 1957.

Southern Natural Gas Co.

Project: 27 miles of 12-in. from Gloria, La., to Lake Enfermer field.

Status: Under way.

Contractor: **Brown-Root Co.**

Completion: November 1, 1956.

• **Tennessee Gas Transmission Co.**

Project: 221 miles of 30-in., 101 miles of 26-in., and 10 miles of 24-in. looping from Portland, Tenn., to Greenup, Ky.; from Morehead, Ky., to Catlettsburg, Ky.; from Catlettsburg to Broad Run, W. Va.; from New Wilmington, Pa., to Mercer, Pa.; and from New Castle, Pa., to near Pittsburgh, Pa.

Status: Pending FPC approval.

Project: 51 miles of 26-in., 51 miles of 20-in., and 17 miles of 12-in. gathering lines from Kinder, La., to offshore fields in Gulf of Mexico.

Status: Pending FPC approval.

Project: 577 miles of 30-in. from Mississippi River delta area south of New Orleans to Portland, Tenn.

Status: Pending FPC approval.

• **Texas Eastern Transmission Co.**

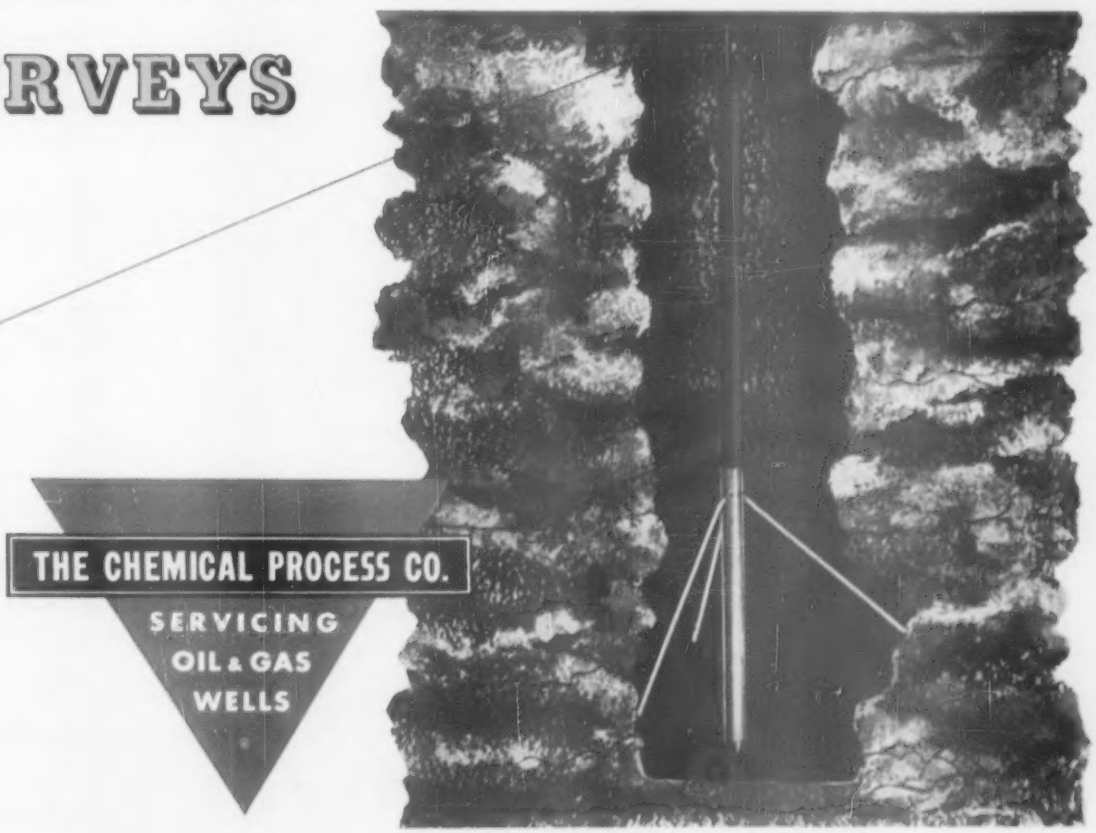
Project: 422 miles of 30-in. from near McAllen to Beaumont, Tex., to move imported Mexican gas; 45 miles of 24-in. laterals from McAllen to Provident City, Tex., 77 miles of 30-in. looping between Kosciusko, Miss., and Uniontown, Pa.; 147 miles of supply and sales laterals.

Staus: Has FPC approval to start immediately.

Completion: Fall 1957.

Texas Gas Transmission Corp.

Project: 120 miles of 20-in. and 11 miles of 16-in. from near Eunice, La., east to near Thibodaux, La.



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FOR ALL PRESSURES!
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Available with screwed or socket weld ends. 3000-lb. sizes ⅛" to 3"; 6000-lb. sizes ¼" to 2".

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Hammer-type for quick opening and quick closing.

Write for Catalog 56 showing the complete Catawissa line of Perfect Seal Products

CATAWISSA VALVE AND FITTINGS COMPANY
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Pipeline Patrol

Status: Work to start late October.

Contractor: **Houston Contracting Co.**

Spreads: 11 miles of 16-in. and 50 miles of 20-in. from near Eunice to near New Iberia, F. A. Silar, spread superintendent, office at Crowley, La.; 45 miles of 20-in. from near New Iberia to near Morgan City, M. L. Thompson, sperad superintendent, office at Jeanerette; 25 miles of 20-in. from near Morgan City to near Thibodaux, W. H. Hayes, superintendent, office at Thibodaux.

Completion: December 1956.

• **Trans Carolina Pipe Line Corp.,** Commercial Building, Raleigh, N. C.

Project: 300-mile system across North and South Carolina, plus 500 miles of laterals.

Status: FPC approval pending

• **Transcontinental Gas Pipe Line Corp.**

Project: 160 miles of 36-in., 67 miles of 30-in., 24 miles of 24-in. loops from Louisiana to Pennsylvania.

Status: Pending FPC approval.

Completion: December 1, 1956.

Project: 25 miles of 36-in. loops from Louisiana to South Carolina, 31 miles of 36-in. and 43 miles of 30-in. line.

Satus: Pending FPC approval.

United Fuel Gas Co.

Project: 15 miles of 12-in. in Kanawa County, West Virginia.

Status: Under way.

Contractor: **Williams - Austin Co.;** O. L. Martin, spread superintendent, office at Charleston, W. Va.

Completion: November 1956.

United Gas Pipe Line Co.

Project: 14 miles of 10-in. from Lake Pasture and Mary Ellen O'Connor fields to near Refugio, Tex.

Status: Under way.

Contractor: **Golightly Construction Corp.**

Completion: November 1, 1956.

Foreign Crude-Oil Pipelines

Arabian American Oil Co.

Project: 140 miles of 20-in. from Safaniya field to Ras Tanura, Saudi Arabia.

Status: Under way.

B-A Alberta Pipe Line, Ltd.

Project: 35 miles of 8-in. to connect Drumhell field, Alberta, with existing lines running to Edmonton.

Status: Pending approval.

Interprovincial Pipe Line Co.

Project: 151 miles of 20-in. to extend present line from Sarnia to Port Credit, Ont.

Status: Pending approval of Board of Transport Commissioners. If approved, work will start spring 1957, end that fall.

• **Mene Grande Oil Co.**

Project: 11 miles of 6-in. from Elias to Fria, and 10 miles of 10-in. from Limon to Leona-Dacion lateral, Venezuela.

Completion: First quarter 1957.

Project: 24 miles of 12, 14, 16-in. from Oficina Tank Farm to Oveja.

Completion: Late 1956.

Pembina Pipe Line, Ltd.

Project: 100 miles of 3 to 10-in. gathering system in Pembina field.

Contractor: **Sparling Davis Co., Ltd.**

Project: 200 miles of 3 to 12-in. gathering line in Pembina oil field.

Contractor: **Mannix, Ltd.;** F. Whitlow, spread superintendent, office at Pembina oil field.

• **Royal Dutch-Shell**

Project: 700-mile line across Europe from the Mediterranean to the North Sea, running through Eastern France, Luxembourg, West Germany, and Netherlands, and Belgium. Main trunk to be 30-in.

Status: Company is considering project together with several other companies.

• **Sinclair Oil Corp. and Socony Mobil Oil Co.**

Project: 211 miles of 20-in. from the Silvestre field in Barinas, Venezuela, to Puerto Cabello on Caribbean Sea.

Status: Planned.

Union of Soviet Socialist Republic

Project: 2,300-mile Trans-Siberian crude and products line from Ufa and the Tuimaza fields in Bashkiria to Irkutsk near Lake Balkal.

Status: Under way.

Yacimientos Petroliferos Fiscales (Argentina)

Project: 700 miles of 12-in. from Campo Duran to San Lorenzo.

Status: Under way.

Contractor: **TECHINT** (Compania Tecnica Internacional), Buenos Aires, has 90 miles.

Yacimientos Petroliferos Fiscales Bolivians (Y.P.F.B.)

Project: 160 miles of 10-in. and 43 miles of 8-in. from Sicascia to Arica on the Chilean coast.

Contractor: **Williams Brothers Co.**

Completion: December 1957.

Foreign Products Pipelines

• **Estrada de Ferro Santos a Jundial Departamento Oleducto**

Project: 6 miles of 14-in. from Capauva refinery to Utinga Terminal.

Status: Planned.

Completion: December 1956.

Hydrocarbons Pipeline Co. (Subsidiary of Canadian Hydrocarbons)

Project: 800 miles of 6 and 8-in. L.P.G. line from near Edmonton, Alta., to Fort William, Ont.

Status: Has permit from Parliament of Canada. If approved by Federal Board of Transport Commissioners and the Alberta Petroleum and Natural Gas Conservation Board, work will start early 1957.

Construction consultants: **Dutton-Williams Brothers, Ltd.,** Calgary, and **A. D. Little & Co.,** Boston.

• **Iraq Petroleum Co., Ltd.**

Project: 75 miles of 24-in. from Homs, Syria, to Tripoli, Lebanon.

Israeli Government

Project: A 6-in. line from the Haifa refinery to Tel Aviv.

Completion: Late 1957.

National Iranian Oil Co.

Project: 573 miles of 10-in. from Ahwaz to Teheran, Iran.

Contractor: **Enterpose of Paris,** has northern 236 miles. Southern section completed.

• **North Atlantic Treaty Organization (NATO)**

Project: 2,000 miles of lines to airfields in parts of Europe.

Status: Under way.

Contractors: **Associated Pipeline Contractors, Inc.,** has 450 miles from Iskenderun, Turkey, to Batman. **TECHINT** (Compagnia Tecnica Internazionale), Milano, Italy, has 205 miles of 4-in. from Bandirma to Eskisehir, Turkey, and 250 miles of 8-in. from Antalya to Eskisehir. Bids were taken in January 1956 on 300 miles of 12-in. between Marseille and Langres, France.

United States Defense Department

Project: Sponsoring 485 miles of 8, 10, 12-in. from Cadiz to Zaragoza, Spain.

Contractors: Prime contractor — **Brown-Raymond-Walsh; Merritt Chapman & Scott, Benson & Montin** of Oklahoma City, **Agroman Construcion Co.** of Spain.

Yacimientos Petroliferos Fiscales Bolivianos (Y.P.F.B.)

Project: 190 miles of 4-in. from Camiri to Santa Cruz.

Contractor: **Williams Brothers Co.**

Completion: December 1956.

Foreign Natural-Gas Pipelines

• **Alberta Gas Trunk Line Co., Ltd.**

Project: 637 miles of 34 to 16-in. gathering lines in Alberta.

Contractor: **Dutton-Williams Brothers, Ltd.,**

New V-type wellhead aids gas flow, prevents frozen valves!

You may never use or even need a wellhead assembly just like this one. Yet the reason why it exists is important to you.

Designed and built exclusively by National Supply, this V-type wellhead is a boon for gas producers—especially if their wells have considerable moisture content and are located in cold-weather areas. In conventional trees with side outlets at 90 degree angles, moisture tends to condense in the valve and freeze at subzero temperatures. In an effort to help several Canadian customers facing this troublesome problem, we developed the V-type tree.

With side outlets at 45 degree angles, the condensate either runs into the flow line or back into the well bore. Unhindered by ice, the wing valve remains operable and the improved flow remains constant! This design also minimizes cutting and washing action where gas production contains sand or other harmful solids. Thus it has broader application—like many new designs originally developed to satisfy special, limited needs.

National Supply is always willing to render all possible help on special oilfield equipment needs. That's the reason why this wellhead, as a recent example of such aid, is important to you. National is also thoroughly prepared—with the world's most complete line of quality drilling and production equipment, 129 conveniently-located supply stores, nearly two thousand field representatives, and the staffs of six plants. What is your special need or problem?

THE
NATIONAL SUPPLY
COMPANY

No wellhead problems National's line

The V-type wellhead shown on the previous page is just one example of National Supply's leadership in trouble-free wellhead design. Actually, every part of a National Wellhead assembly—from the bonnet to the casing flange—is designed, built and tested for specific service application.

The following main features of National Wellhead Equipment insure maximum performance with utmost safety—

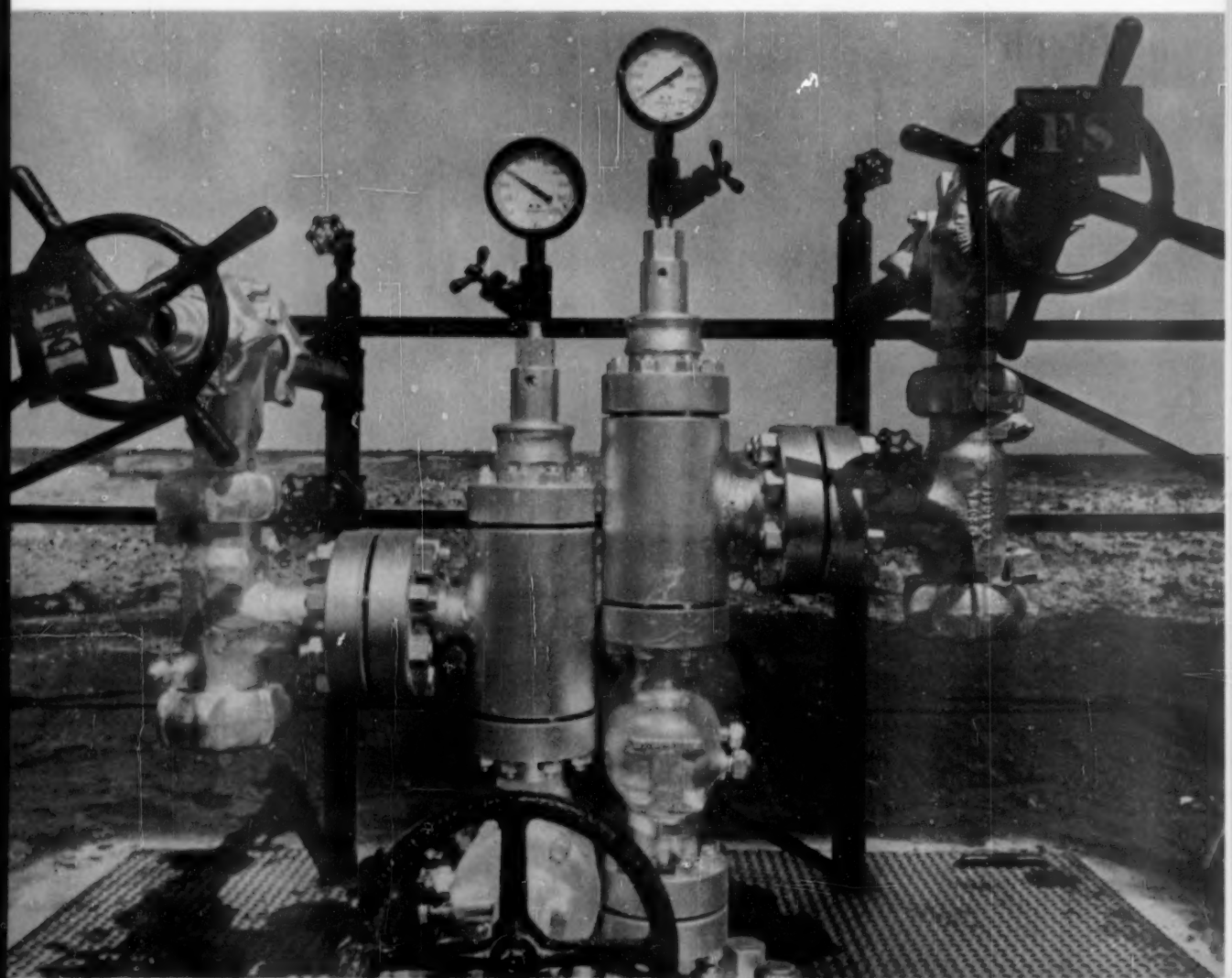
Ease of assembly—parts are self-locating and self-activating, no special tools are needed for installation.

Maximum flexibility—interchangeable units afford a multitude of combinations to meet your specific needs in size, capacity and type.

Pre-tested safety—National's triple-sealed Pressure Pack design insures trouble-free performance and longer service life. Intensive testing procedures include special methods more severe than those specified by API standards.

You'll find National Wellhead Equipment readily available through all National Supply Stores—as well as complete advisory service on wellhead application problems. A complete line in every store's stock includes a wide variety of tubing hangers, bonnets, flanged and screwed fittings, valves, flow beans and specialty items to meet your every need. It will pay you to use this quality wellhead equipment and the helpful service that comes with it.

Dual-completion wellhead assemblies like this National installation are very economical under the proper conditions. This operates two parallel strings of tubing, and has two master valves to allow maintenance on one without stopping production on the other.



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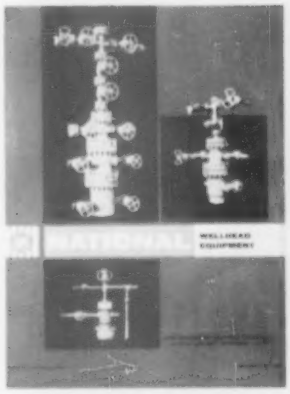
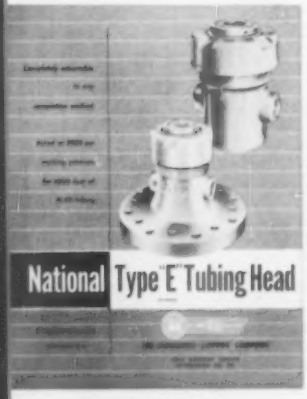
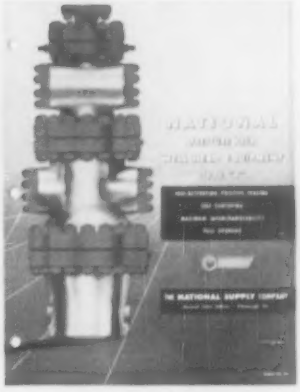


Bulletin No. 444
• NATIONAL WELLHEAD EQUIPMENT CATALOG



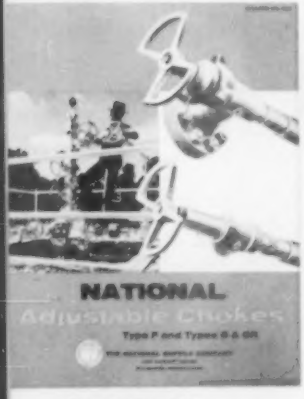
Bulletin No. 424
• TYPE "E" TUBING HEAD

Bulletin No. 432
• TYPE "A" CASING SUPPORT

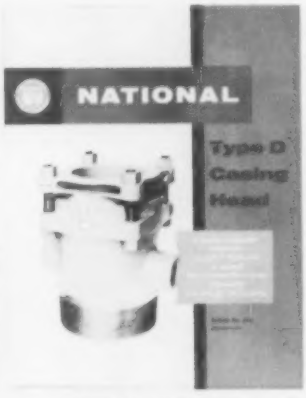


Bulletin No. 395
• TYPE "B" PRESSURE PACK WELLHEAD EQUIPMENT

Bulletin No. 460
• TYPES "W" AND "W-1" TUBING HEAD



Bulletin No. 442
• TYPES "F," "G" AND "GR" ADJUSTABLE CHOKES



Bulletin No. 433
• TYPE "D" CASING HEAD

THE
NATIONAL SUPPLY
COMPANY

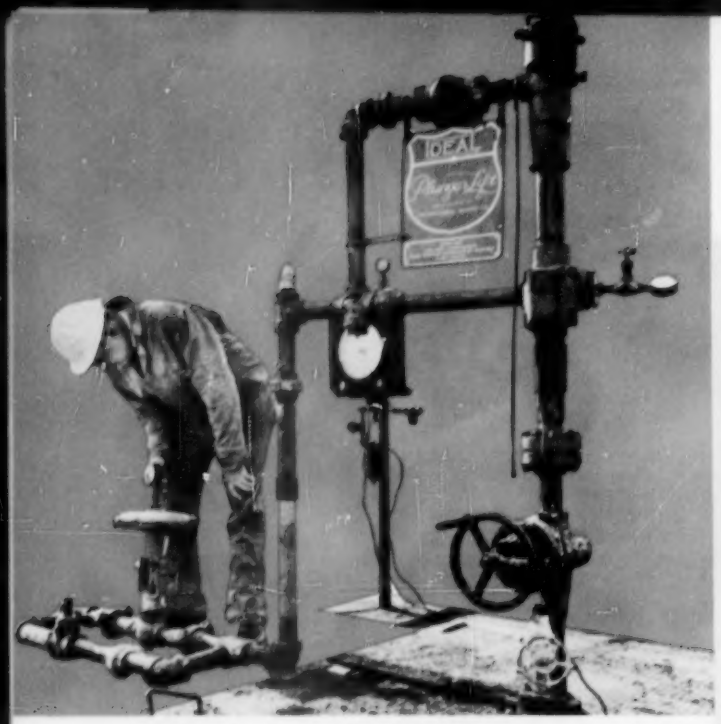
MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Penna.
DIVISION OFFICES: Denver; Ft. Worth; Houston; Toledo; Tulsa; Torrance
CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta
EXPORT: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; City Wall House, Chiswell Street, London E. C. 1

NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

If you haven't received copies of these informative National bulletins, tell us the ones you'd like to have. Write The National Supply Company, Two Gateway Center, Pittsburgh 30, Pa.

DO YOU HAVE A WELL THAT NEEDS NATIONAL'S PLUNGER LIFT?

SEE THE NEXT PAGE



NATIONAL PLUNGER LIFT®. . . a low-cost production system for "problem" wells!

Here's a proven, low-cost system for prolonging production from wells with declining natural energy. Simply designed, easy to install and economical to operate, the National Plunger Lift uses either formation or injected gas to step up recovery in many types of wells. It's especially effective for preventing and removing paraffin deposits, preventing bottom-hole water accumulation and reducing emulsion and scale deposits.

These features of the National Plunger Lift, along with its low initial and service costs, make it a unit that quickly pays for itself. The National Supply representative or store personnel in your area will be glad to tell you more. They have descriptive bulletins and a special Well Analysis form you should see.

THE
NATIONAL SUPPLY
COMPANY

MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Penna.
DIVISION OFFICES: Denver; Ft. Worth; Houston; Toledo; Tulsa; Torrance
CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta
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NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

YOU ALSO GET OUTSTANDING PERFORMANCE FROM—

NATIONAL Pumping Units

These pumping units are manufactured in 22 standard combinations, in the range of API rated beam loads from 3,200 to 32,400 lbs. There's a National Pumping Unit to economically suit every pumping job.

NATIONAL Triplex Pumps

These pumps provide maximum volume and injection pressures for today's waterflood projects. Available in several hp ratings for both corrosive and non-corrosive service, these National Pumps are also suited as power-oil source for sub-surface hydraulic pumping, oil gathering and salt water disposal services.

NATIONAL Sucker Rods

You get trouble-free service with National's precision-manufactured sucker rods. Engineered for maximum life under impulse loading, National Sucker Rods are available in a range of grades to handle corrosive and non-corrosive well conditions.

Pipeline Patrol

has preliminary studies, design and management-engineering.

Completion: Approximately 40 miles to be completed in 1956; remainder in 1957 and 1958.

Andes Pipeline Corp. (Subsidiary of Glenn McCarthy, Inc.)

Project: 500 miles of 12-in. from McCarthy's Bolivian concession to the Chile copper-mining area.

Contractor: Will do own work.

• **Attock Oil Co.**

Project: 60 miles of line from Dhulian field to Rawalpindi in West Pakistan.

Status: Planned.

Cia. Shell de Venezuela.

Project: 177 miles of 20-in. from La Paz field in the Maracaibo district, to the Cardon refinery on Paraguana Peninsula, to fuel refinery furnaces.

Status: Planned.

Completion: 1957.

• **Empresa Nacional Del Petroleo.**

Project: 80 miles of 10-in. from Concon to Santiago, Chile.

Status: Planned.

Project: 130 miles of 22-in. to parallel a 14-in. line from Reynosa to Monterrey in northern Mexico.

Inland Natural Gas Co., Ltd.

Project: 350 miles of 12 to 4-in. system in British Columbia, and 400 miles of distribution piping in 31 towns.

Status: Clearing and grading under way.

Contractor: **Dutton-Williams Brothers, Ltd.;** Pat Campbell, project manager, office at Penticton.

Completion: September 1957.

Mid-Western Industrial Gas, Ltd.

Project: 18 miles of 6-in. from the new gas plant at Redwater, Alta., to the nickel plant at Fort Saskatchewan, including a crossing of the North Saskatchewan River.

Status: Under way.

Contractor: **Fulton Banister, Ltd.**

Completion: Fall 1956.

South Alberta Pipe Line, Ltd.

Project: 150 miles of 8-in. from Etzikom field to serve a nitrochemical plant to be built near Medicine Hat, Alta.

Status: Filed for permit.

Sui Gas Transmission Co.

Project: 188 miles of 16-in. from Sui gas field to Moultan, Pakistan.

Status: Under way; to be extended later to Lahore with branches at Kot Addu, Jhang Magiana, and Montgomery.

Contractors: **Pakistan Constructors,** a joint company of **Morrison-Knudsen** of Boise Idaho, and **William Press, Ltd.,** of London.

• **Technical Office of Hydrocarbon, Ministry of Mines and Petroleum, Government of Venezuela.**

Project: 321-km., 26-in. line from Anaco to La Mariposa near Caracas.

Status: Proposed.

• **Trans-Canada Pipe Lines, Ltd.**

Project: 574 miles of 34-in. from the Alberta-Saskatchewan border to Winnipeg. (First part of 2,250-mile line from Alberta to Toronto and Montreal.)

Status: Under way.

Contractors: **Majestic Contractors, Ltd.; Canadian Bechtel, Ltd.** (110 miles from Swift Current to Moose Jaw, Sask., J. L. Work, general superintendent, office at Moose Jaw); **Mannix, Ltd.** (90 miles from Moose Jaw to Welseley, spread superintendent, T. Anderson, office at Montmartre, Saskatchewan); **Dutton-Williams Brothers, Ltd.** (87 miles from Deveren to Moosomin, to start in 1957).

Westcoast Transmission Co., Ltd.

Project: 650 miles of 30-in. from Peace River area, Canada, to Sumas, Wash.

Status: Under way.

Contractors: **Dutton - Williams Brothers, Ltd.,** has 120 miles from Taylor, B. C., to Azouzetta Lake, T. E. Davis, spread supt., office at Dawson Creek, B. C.; **Mannix, Ltd.,** has 110 miles between Huntingdon and Merritt, Fred Byers, spread superintendent, office at Chilliwack; **Canadian Bechtel, Ltd.,** has 210 miles from Alexandria to Pine Pass, B. C., H. F. (Hank) Mogg, spread man, office at Quesnel, B. C.; **R. A. Conyes Construction Co.,** has 210 miles.

Completion: Dutton-Williams section to be completed November 1957. R. A. Conyes section and Canadian Bechtel section to be completed September 1957.

HYDROCARBON WELL LOGGING

Domestic and Foreign

CARAN ENGINEERING CORPORATION

MILAM BLDG. SAN ANTONIO

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with Complete Satisfaction . . . . . .

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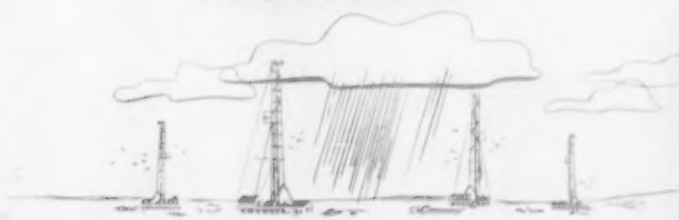
Flash Welded
TOOL JOINTS



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- Fires one or a battery of boilers.
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- Saves labor.
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NOW BUYS
MUDWONDER

J. W. "Bill" Hall of Durham Drilling Co. now buys Mudwonder Mudline Valves for zero maintenance.

Edward Valves, Inc., Subsidiary of Rockwell Manufacturing Company, East Chicago, Ind.

Among the Drilling Contractors

Davis Gets Higher Post With Tulsa Drilling Firm

J. M. DAVIS

Reed Drilling Co., Tulsa, announces that James M. Davis, tool pusher headquartering at Okemah, in Okfuskee County, Oklahoma, has been made drilling superintendent at the same place. Davis has had long experience in oil field work, both in Oklahoma and Texas. He is a native of the former state. He is a Navy veteran of World War II. He became associated with Reed a year ago.

The company, headed by R. B. Reed, as president, operates principally in Oklahoma. Current drilling is in Osage, Seminole, Noble, and Grant counties.

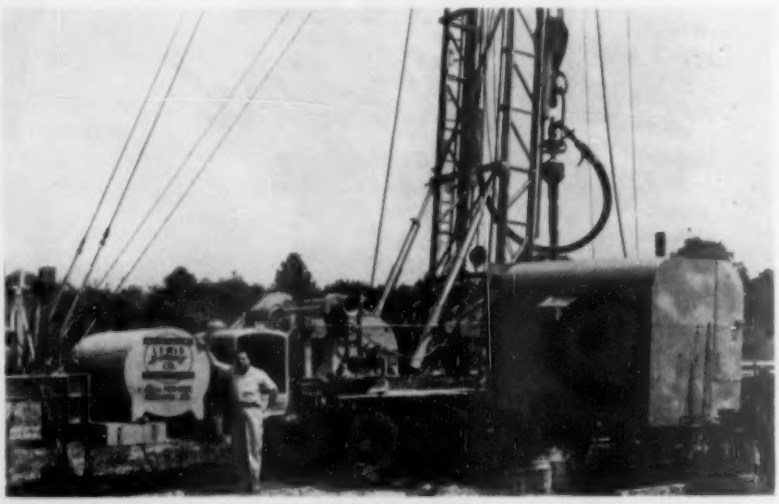
B & G Well Maintenance Service Co. will drill a 9,500-ft. wildcat test for British-American Oil Producing Co. at the southwest tip of Cameron Parish, southwestern Louisiana. Location is on the east bank of Sabine Lake, near the mouth of Sabine Pass. Designation is 1-G State Lease 2875.

Drilling & Exploration Co., Houston, has contracted for another deep exploratory test Pan American Production Co. and Austral Oil Exploration, Inc. have projected for the South Thornwell area in southern Jefferson Davis and northern Cameron parishes, southwestern Louisiana. Plans call for a 15,000-ft. test. Location is at 2 Amanda Fontenot, in 2-12s-5w, on the Cameron Parish side of the line, about a mile southwest of production.

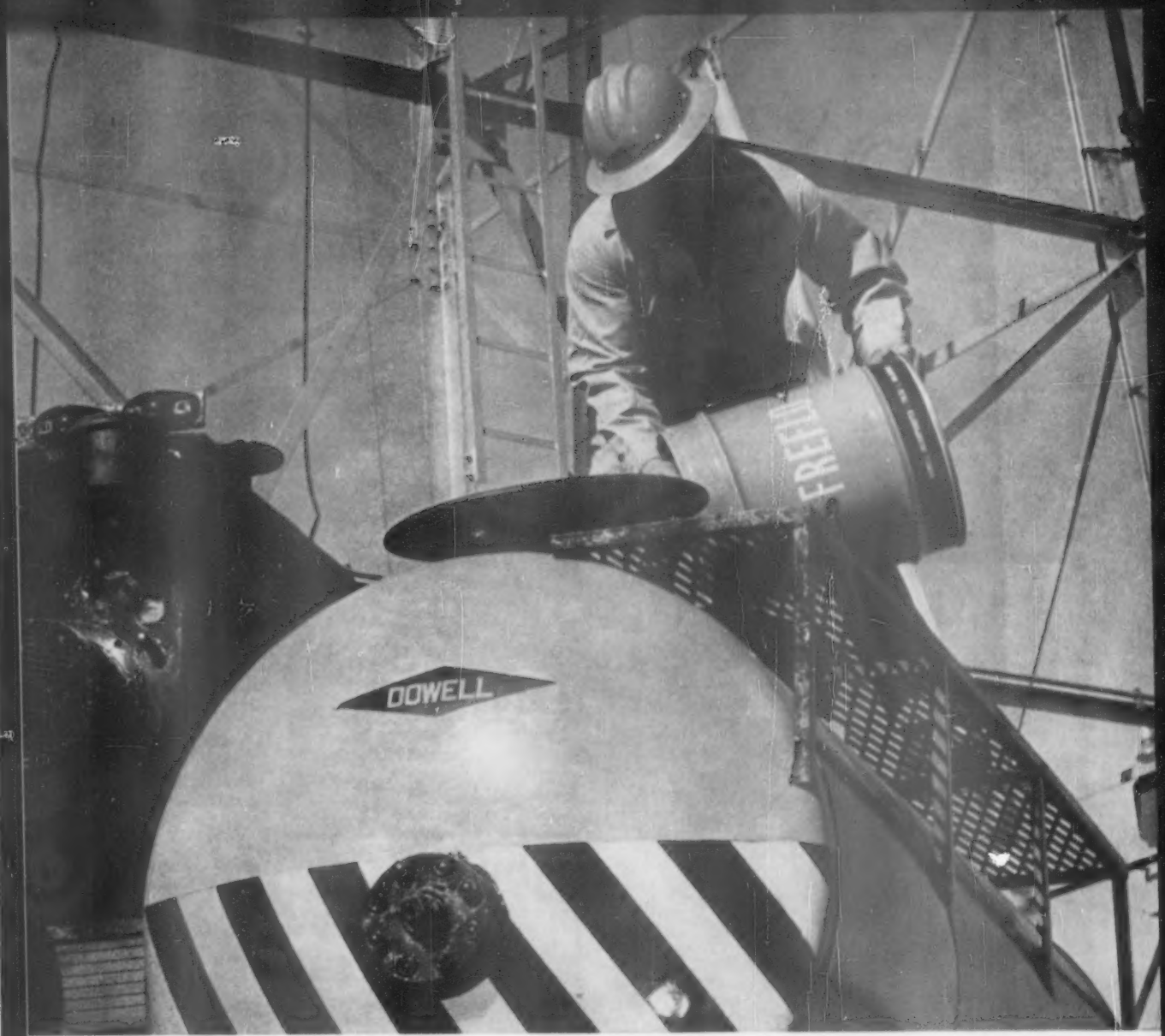
Wheless Drilling Co., Shreveport, will do Phillips Petroleum Co.'s drilling on a wildcat test a mile east of production in the Logansport field, DeSoto Parish, northwestern Louisiana. It is a 6,300-ft. Pettet test at 1-A Hub. Location is in 1-11n-15w.

Johnson Drilling & Service Co., Magnolia, Ark., is on a new contract operation in northwestern Lafayette County, southwestern Arkansas. It is a Smackover wildcat for Sunray Mid-Continent Oil Co. at 1 Foster, in 5-15s-25w, 1¼ miles southeast of Hervey. Objective is expected about 6,750 ft.

Jett Drilling Co., Inc., Shreveport, has a new Lower Cretaceous operation north of Lake Bruin, in east-central Tensas Parish, eastern Louisiana. Drilling is for its own account and is expected to be carried to 9,200 ft. Location is on the contractor's Krone lease, in 28-12n-12e. It is about 1½ miles north of the discovery well of Lake Bruin field.



LEWIS DRILLING CO. uses this slim-hole rig for drilling in the Illinois basin. The company maintains headquarters at Princeton, Ind., and operates in the Tri-state area where drilling depths range from 1,500 to 3,500 ft. Arnold F. Lewis, president and owner of the company



One 10-gallon drum of Freflo diluted with oil makes 1000 gallons of treating fluid . . . average treatment: about 20 gallons of Freflo in 40-48 barrels of oil.

UNLOCKS WATER BLOCKS

FREFLO*, a new Dowell product, could well be the answer when you face production problems that indicate the possible presence of a water block.

For example, problems like: (1) No production after completion, although a good show was obtained when the well was drilled in. (2) Loss of production after re-working. (3) Loss of production after prolonged shut-in. (4) An abnormal production decline.

Freflo eliminates water blocks by reducing the water's surface tension and lowering the interfacial tension between water and oil. Freflo also helps to dissolve asphalt or paraffin deposits.

Freflo is easy to use—requires no special well equipment or preparation. Just mix Freflo with diesel oil or fresh, high-gravity crude, then pump it into the formation. Or; if you wish, Dowell will do the job for you.

Ask for Freflo in 10-gallon steel drums at any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oilwell Service. Or write Dowell Incorporated, Tulsa 1, Oklahoma, Department J-11.

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services for the oil industry

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L-P GAS TESTING EQUIPMENT

Tests . . .

• PROPANE • BUTANE • OTHER LIQUIFIED PETROLEUM GASES

VAPOR PRESSURE BOMB

Designed for NGAA Standard No. 2140 requirements. Used for the determination of the gauge vapor pressure of liquified petroleum gas products. This apparatus consists of a bomb having two sections, or chambers. An upper 80% capacity chamber and a lower 20% capacity chamber. A bleeder valve, inlet valve, and chamber separating valve are included. Bomb and gauge connections use "O" ring seals permitting hand tightening. Each bomb tested to 500 psi. Range 0-300 lbs.

CORROSION TEST BOMB

Tests the corrosiveness of LP gases. An all stainless steel bomb for corrosion tests by the copper strip method. Sealed by a neoprene "O" ring which makes it possible to make the bomb pressure tight with the hands and without wrenches. Complete with two nickel plated valves, connecting hose with swivel connections, adapter to ¼-inch pipe.

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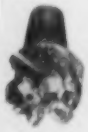
NEW KINZBACH SPEEDMILLS *Slash* DOWN-HOLE CUTTING TIME

UTILIZING TUNGSTEN CARBIDE PARTICLES that continuously renew their cutting edges, new Kinzbach Speedmills offer you faster, surer milling under even rugged down-hole conditions.

Kinzbach Speedmills require less torque for cutting . . . eliminate drill pipe wind-up . . . reduce shock on drilling string . . . are unaffected by heat generated by normal cutting action. The usual close control of speed and weight required in ordinary subsurface cutting operations is not necessary with Kinzbach Speedmills.

Types available for every down-hole milling problem.

Type 134 Speedmill



Type 155 Speedmill

Type 156 Speedmill

Type 150 Speedmill

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1955-56 DIRECTORY
OF PLANTS AND PERSONNEL

- CRUDE-OIL REFINERIES
- FIELD-PROCESSING PLANTS
- PETROCHEMICAL PLANTS

This new edition of The Journal's Annual Directory brings you the results of six recent surveys of the processing side of the oil and gas industry. The surveys cover installations in the U. S. and Canada. It brings you the facts.

- A statistical summary arranged alphabetically by state and company which gives you the names, capacities, and processes.
- An alphabetical listing giving plant location for 341 crude-oil refineries, 531 field-processing plants and 260 petrochemical plants.
- In addition to the plant-by-plant surveys you get the names of over 6,500 key executive and operating personnel.

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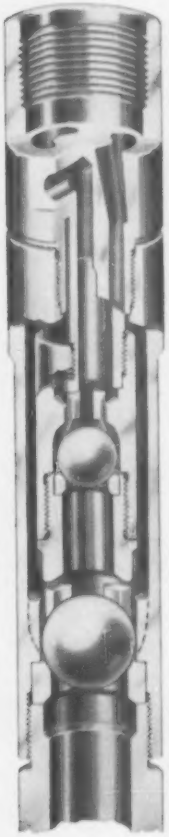
Showcase

OF NEW EQUIPMENT AND LITERATURE

by Dan B. Miller

New Bottom-Discharge Valve Allows Easy Maintenance



This new bottom-discharge valve offers long life and ease of maintenance. The Oilmaster Model 63 contains a discharge cage with six spline ball guides forming their own spherically contoured ball stop. The screw-type seat is made in two pieces; the stainless-steel seat plug, which shoulders externally on the cage, and a tungsten-carbide seat brazed into a recess in the top of the seat plug. This arrangement eliminates the need for a seat shoulder in the cage and improves fluid-flow characteristics even with a shortened ball lift. The discharge cage is a separate unit and, when worn, may be changed as readily as the plunger-blind cage.

The discharge body, which contains the discharge ports and suction fluid passages, is machined from one piece of steel,

The standing-valve cage is an individually replaceable unit. It serves also as the housing around the discharge cage. The bottom of the seat plug on the screw-type seat acts as the standing-valve ball stop. This circular stop, with its fluid cushion, effectively dampens out the ball pound and gives improved cage life. **For more information write or call: Fluid Packed Pump Co., Los Nietos, Calif.**

New Portable Ramps Make Roadway Over Hoses

New portable hose ramps make a smooth roadway for traffic to pass over fire hoses, fuel lines, and air hoses up to 4 in. in diameter. Each ramp is made of lightweight magnesium (36 in. long, 16 in. wide, and weight 20 lb.) and constructed to give rigid support to 10,000 lb. Other ramps support up to 40,000 lb. each. Safety tread provides good traction in all weather.

Pairs of ramps are held together by heavy neoprene belting to give flexibility on rough terrain and allow sections to fold for easy storage. Special ramp extenders (filler strips) make a longer roadway when multiple hoses must be crossed. Portable hose ramps serve in both emergency and regular use. Easily stacked and carried, they are especially valuable in petroleum work where flexible lines are often thrown across roads or work areas. The quick, portable roadway allows regular traffic to proceed and speeds up service and maintenance vehicles. **For more information write or call: Copperloy Corp., 4133 Brookpark Road, Cleveland 29, Ohio.**

●

Plastic and Steel Compound Repairs and Bonds Metal

Devcon combines 80 per cent steel and 20 per cent plastic. This new product is as easy to use as modeling clay. Two hours after the addition of a special hardening agent, the mixture becomes a rigid, tough, strong, steel-like mass. Once hard, it can be sawed, drilled, threaded, or ground with regular metal-working tools.

Devcon was developed originally for

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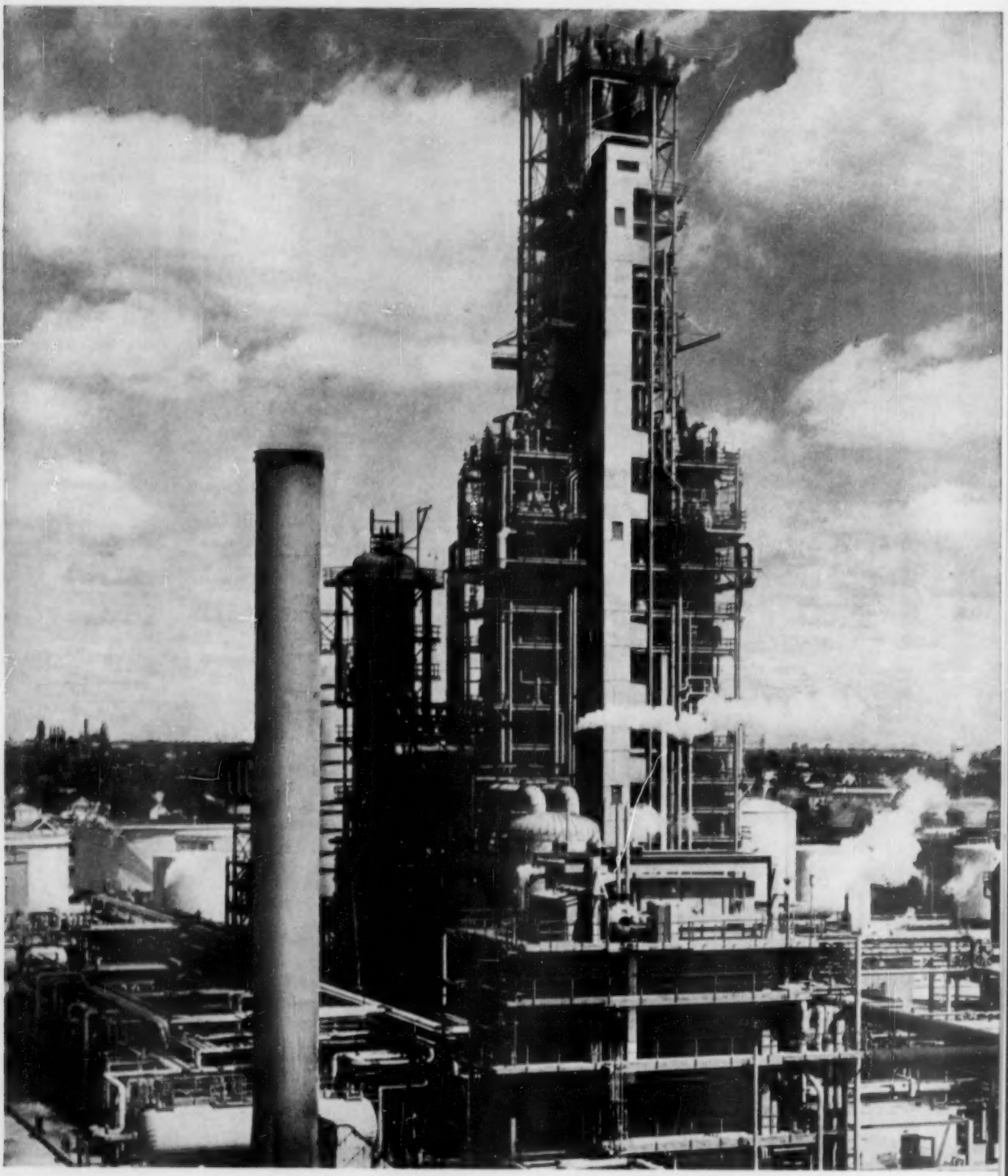
Refinery Operating Records Prove...

Fuel Costs Go Down When



A B&W CO Boiler Goes In

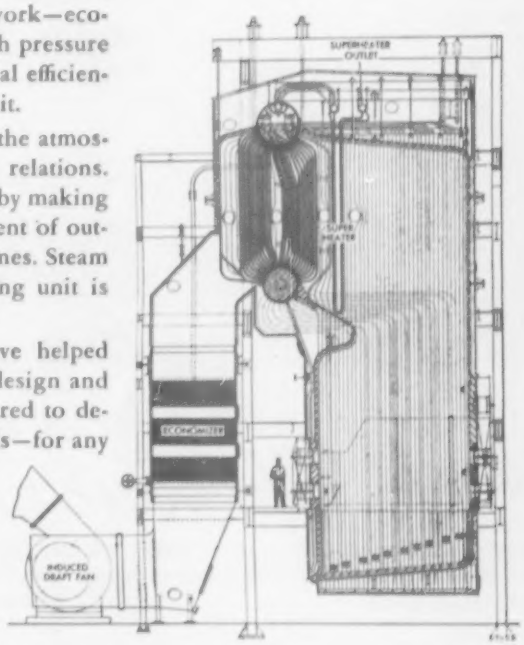
Savings Can Be Calculated in Thousands of Dollars... Atmosphere is Kept Clean

Designed and developed to raise refinery thermal efficiency to still higher levels, the B&W CO Boiler has effectively demonstrated its *reliability, efficiency and economy in extended, sustained service.*

FUEL SAVINGS ARE SUBSTANTIAL because sensible and combustible heat content is put to work—economically. Steam can be produced at high pressure and temperature, resulting in high thermal efficiencies for prime movers of the cracking unit.

OTHER ADVANTAGES include keeping the atmosphere clean for improved community relations. Also, the CO Boiler simplifies operation by making your cracking unit completely independent of outside sources of steam and energy at all times. Steam is always available—whether the cracking unit is operating or shut down.

DIFFERING REFINERY CONDITIONS have helped develop CO Boilers that are flexible in design and arrangement. B&W engineers are prepared to design a unit that will meet your exact needs—for any steam pressure or temperature and *any size* cracking unit—large or small. Write for details—The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, New York.



B&W CO Boiler in midwestern refinery delivers 190,000 pounds of steam per hour at 500 psi and 575 F. It saves 44½ million BTU's per hour.

BABCOCK & WILCOX

BOILER DIVISION

G-814-CO

OIL AND GAS JOURNAL Showcase

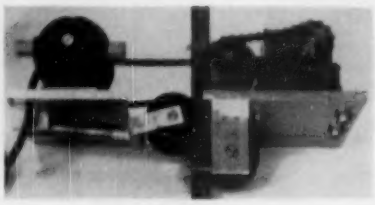
.....OF NEW EQUIPMENT

use by the metal-working industry for making tools, jigs, fixtures, molds, dies, models, and for similar uses. It was soon found that Devcon was an excellent adhesive for metals and could be used for bonding steel, iron, bronze, brass, aluminum and lead to themselves, to each other, or to many other materials including glass, porcelain, concrete, and wood. As a result, Devcon is now being used for rebuilding broken machinery, filling large and small holes in castings, building up worn metal surfaces on machine tools and for repairing stripped threads and bearings.

Two types are available: Devcon A is a putty type that can be applied to a vertical surface and will not run or sag; Devcon B is a viscous liquid that can be poured. Both consist of 80 per cent steel and 20 per cent plastic and have a compression strength of approximately 18,000 psi. There is practically no shrinkage during hardening and, once set, they are durable and permanent.

A special hardening agent is supplied with every can of material. Simply add the hardener to the plastic, stir it, then press or pour it into the shape you desire. It hardens in 2 hours to a rigid piece of metal that can be machined like steel. No heat or pressure is required. **For more information write or call: Devcon Corp., Danvers, Mass.**

●



Automatic Driller Records, Controls Weight on Bit

An automatic driller offers better control of critical problems found in diamond drilling, diamond coring, and directional drilling. It maintains a close watch and control over variations in weight on the bit.

A diaphragm mounts on the deadline as a sensing element. Through a control panel hydraulic impulses from the diaphragm are changed to electrical impulses. These govern the movement of the crawler on the drilling line. As the crawler is propelled downward, it releases the brake lever. This reels off more line from the drum. When the proper weight is set down on the bit, the crawler is stopped by the control box and holds its position until more weight is required, as sensed through the diaphragm. A 24-hour recorder keeps a permanent record of weight on the bit. **For more information write or call Bell Corp., Odessa, Tex.**

●

Radio Receiver Functions As Conelrad Alert Monitor

A low-cost AM radio receiver becomes an automatic warning device in case of an enemy air attack. This Conelrad alert monitor has a dual function as an ordinary broadcast receiver and automatic air-raid alert system. This makes the receiver applicable for all transmitter operations which will be required by January 1957 to provide facilities for receiving Conelrad alerts.

Base stations in mobile communications systems, radio dispatchers' offices, transmitter locations, and control centers will be provided with an inexpensive means of complying with the new FCC ruling.

When switched to the normal position, the alert monitor is tunable to

any radio station within range in the AM broadcast band, 540 to 1620 kc. In the Conelrad position, the receiver is inaudible but becomes activated when a Conelrad alert has been initiated. **For more information write or call: Allen B. Du Mont Laboratories, Inc., Mobile Communications Sales Department, 760 Bloomfield Avenue, Clifton, N. J.**

●

Liquid Meter Utilizes Crank-Type Linkage

A new line of Rotocycle liquid meters offers larger capacity, longer life, quiet operation, and reduced maintenance costs. The meters feature a new crank-type linkage for vane control. Three models offer flow capacities ranging from 400 to 1,000 g.p.m.

By utilizing a control plate and control arms in place of gear arrangements,

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the new linkage cuts down the number of parts, giving stronger control of vane positioning and therefore increases capacity and life expectancy.

The crank-type rotors are interchangeable with rotors of Rotocycle meters already in the field, and removal for inspection and maintenance is an easy matter. Repair costs are negligible since the principal points of natural wear are the control arm bushings, which are easy and relatively inexpensive to replace. **For more information write or call: Meter & Valve Division, Rockwell Manufacturing Co., 400 North Lexington Avenue, Pittsburgh 8, Pa.**

●

Wire-Rope Clip Line Offers 16 Sizes, 3 Finishes

A line of wire-rope clips fits wire-rope diameters from ⅛ to 1½ in., 16 sizes in all. They are offered in plain self-colored finish, cadmium plated, or hot-dip galvanized. The U-bolt portion is heavy steel with malleable saddle shaped to fit wire-rope strands giving maximum grip. **For more information write or call: Canton Manufacturing Co., 2408 Thirteenth Street Northeast, Canton 5, Ohio.**

New Primer Works With Tapecoat Coatings

A new priming solution developed especially for use with Tapecoat coal-tar protective coatings is named TC Primecoat. It gives users a primer that is compatible with the coal-tar-pitch base used in Tapecoat protective materials.

TC Primecoat is available in 1-gal. cans, packed 2 gal. to the carton. Application coverage is 400 sq. ft. per gal. **For more information write or call: The Tapecoat Co., 1523 Lyons Street, Evanston, Ill.**

OIL AND GAS JOURNAL Showcase OF NEW EQUIPMENT

New Gear Lubricants Meet Standards of New Equipment

Two products, 509 and 510 multi-purpose gear lubricants, solve problems of lubrication brought about by higher torque and pressure values encountered in modern equipment. A high flash point of 540° F. cuts down evaporation. These two lubricants meet the following requirements: the CRC-L-19

Progress Parades on This Drill Field

And what a drill field! 34,000,000 net acres on which Cities Service spent over seventy million dollars for exploration and development during 1955, pushing steadily forward in the search for oil and gas.

In every sense of the word, this is progress. Progress in increasing vital oil reserves . . . progress in exploration methods . . . progress in a company's growth . . . progress in helping to increase our already highest standard of living.

And this is only one small area of Cities Service progress. One of the largest oil companies in the world, Cities Service continues to grow. Thus, during 1955, sales of petroleum products increased 17% . . . production of petroleum liquids gained 13% . . . and new refining facilities at Lake Charles, Louisiana and East Chicago, Illinois boosted production of aviation gasolene by 52%!

Impressive growth? Yes, but behind it is something more important than the growth itself. It is confidence. Confidence of a major business organization in its future and its country's future . . . and a willingness to invest in both.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

high-speed test; CRC-L-20 high-torque test; CRC-L-37 special-wear and torque test; U. S. ordnance specification MIL-2105; and the Timken-Detroit Axle Co. lever load test of 50 lb. No. 510 lubricant has a viscosity at 210° F. of 160, a viscosity index of 85, and a channel point of from 0 to 10° F. A heating test shows an evaporation loss of less than 2 per cent and a viscosity increase of less than 2 per cent. A moisture-corrosion test and a rustproof test were both negative. **For more information write or call: Lubrication Engineers, Inc., 2809 Race Avenue, Fort Worth, Tex.**

●

Downhole Milling Tools Operate at High Speeds

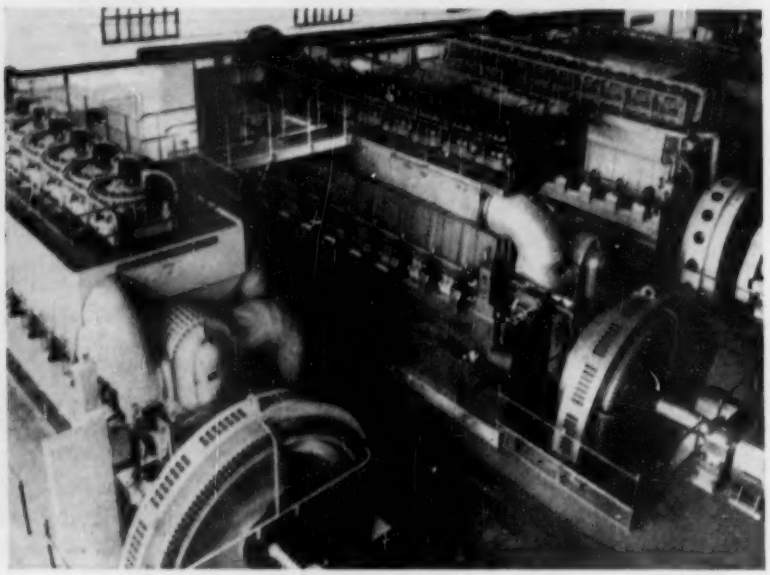
A new line of downhole milling tools, Speedmills, incorporates an aggregate of small tungsten carbide particles imbedded in a softer metal matrix as cutting elements. The use of this aggregate permits greater design freedom

in developing tools for various downhole metal-cutting requirements. These tools perform effectively in metal-cutting operations while being operated at high speeds and with comparatively heavy applications of weight.

The cutting section of Speedmills is very similar to that of a grinding wheel with new cutting surfaces being developed continuously by particle fractures. Very small chips develop, which require less torque than the larger chips cut by continuous-edge-type tools. Reduced torque eliminates drill-pipe windup with its attendant shock on the drilling string. Speedmills may be expected to cut any metal normally used in subsurface tools or equipment at relatively high rates with great flexibility in hookup and operation. **For more information write or call: Kinzbach Tool Co., Inc., P. O. Box 277, Houston, Tex.**

●

Look to COOK for Better Rings!



After 25,037 operating hours... Cook rings good for 10,000 more!

HERE'S the result of a cylinder inspection by Rockville Centre, N. Y., municipal power plant officials. It's a report on their No. 8 Diesel unit after almost three years of continuous operation.

"While several rings were replaced in Grooves 1 and 2, Cook rings in Grooves 3, 4, 5 and 6 could run for another 10,000 hours! And cylinders averaged less than .001" maximum wear per 1000 hours of operation."

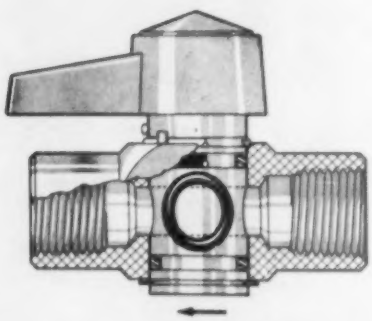
Light-tight Cook Piston Rings prevent scuffing and blow-by . . . conform perfectly to the cylinder wall because they are re-turned as a final manufacturing process. In addition, Cook rings are tensioned by an exclusive, gentle "squeezing" process that guarantees constant, uniform tension — *for life!*

For complete information on Cook Piston Rings and name of nearest representative, write: C. Lee Cook Company, 918 South 8th Street, Louisville 3, Ky.

C. LEE COOK COMPANY

A Subsidiary of Dover Corporation

Rings and Packings Since 1888



Plug Valve Utilizes O-Rings For Leakproof Operation

A new plug valve provides a leakproof shutoff. It operates by a handle that opens and closes against pressure with little effort. The new design of the plug features the use of three O-rings. In the closed position, one

O-ring contained on the surface of the plug (90° from the flow passage through the plug) serves as a flow seal. This flow-seal O-ring surrounds the inlet port and provides dead-tight shut-off. In the open position, the valve is full ported and allows a straight-through flow passage. Static O-rings at the top and bottom of the plug and around its circumference prevent stem leakage.

The use of the O-rings eliminates adjusting nuts and springs, and therefore permits the long maintenance-free service life of the valve. The plug valve is made of brass and is available in ¼-in. female pipe connections. **For more information write or call: Circle Seal Products Co., Inc., 2181 East Foothill Boulevard, Pasadena 8, Calif.**

•

New Insert Flanges Insure Leakproof Pipe Joints

These insert flanges are corrosion-resistant fittings for use with process piping. The inserts are of stainless steel, or other corrosion-resistant alloys, and the flanges are made of carbon steel. When assembled and placed in use only the insert comes in contact with the corrosive element. Insert flanges make a rigid-flange connection with true machine concentric grooves on the gasket face to insure maximum sealing.

Available types include: slip-on insert flanges; roll-on insert flanges for low-cost assembly by using a simple expanding tool; socket-type insert flanges, which are self-aligning and permit better and faster welding; and thread-on insert flanges that are easily used with other screwed pipe and fittings. These insert flanges are available in Types 304 and 316 stainless steels and in sizes from ½ to 6 in. for use with Schedules 5, 10, and 40 pipe. **For more information write or call: Stainless Insert Flange Co., 6526 Upland Street, Philadelphia 42, Pa.**

New Aluminum Pipeline Coupler Stands 1,000 Psi.

JOURNAL Showcase OF NEW EQUIPMENT

An industrial coupler for portable aluminum pipelines withstands working pressures up to 1,000 psi. The coupler connects and disconnects rapidly allowing fast moves. Heavy breach-acting jaws secure the coupler with a quarter turn. A lock screw spins up in an instant and locks the coupler against untwisting through line torque. No metal part of the coupler is exposed to the material within the line; a special aromatic-resistant Buna-N gasket is placed so that there is almost no disturbance of flow to create friction losses. The gasket is pressure sealing.

There are no threads on the body of the coupler to become damaged or clogged with dirt. There are no loose parts to be lost. The coupler protects the ends of the pipes from damage. A corrosion-resistant alloy is used that is compatible with the pipe material. **For more information write or call: John Bean Division, Food Machinery & Chemical Corp., San Jose, Calif.**

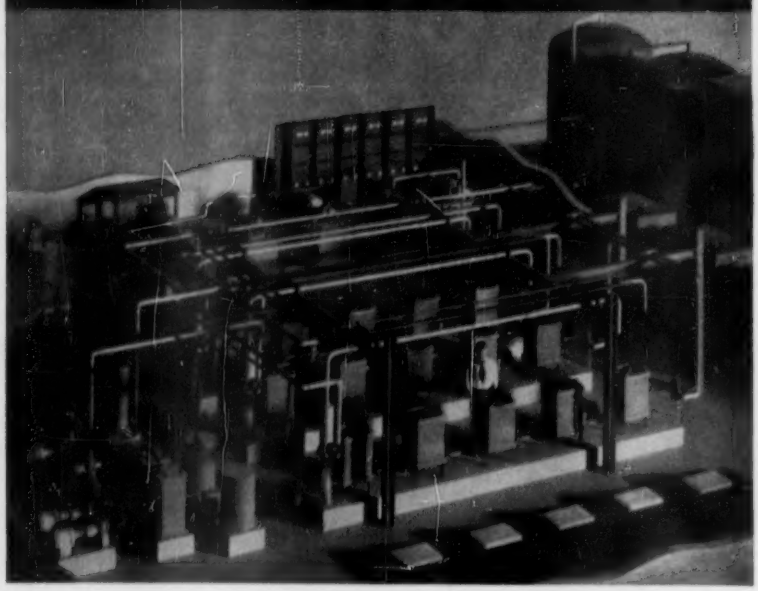
HOW PENN SAFETY CONTROLS PROTECT YOUR ENGINES

Overheated cooling water and lubricating oil pressure failure can occur in the best of engines. When they do, costly damage develops if they aren't stopped quickly. And, that's exactly why Penn Engine Safety Controls are being installed on more and more engines. At the first sign of these troubles, the control warns you in one of three ways — you choose the one you want. The control will sound an alarm . . . or shut down the engine . . . or flash a signal light. Then the fault can be corrected before it becomes expensive. Ask your jobber about this low-cost protection.

PENN CONTROLS, INC. Goshen, Indiana

Automatic Controls For Heating, Refrigeration, Air Conditioning, Gas Appliances, Pumps, Air Compressors, Engines

FRESH WATER
...FROM A BRACKISH WELL



Fifteen months ago, an IONICS electric membrane plant began supplying part of the fresh water required for a drilling and refining community of 5000 people on oil-rich Bahrain Island in the Persian Gulf.

After only five months of operation the purchaser, a major petroleum company, decided to treble the size of the plant and rely on it completely for the community's needs—abundant proof of the reliability and economy of IONICS equipment.

The expanded plant, shown in this model, is now under construction with special allowance for future increases in capacity.

Specifics on the Bahrain plant:

Well water chemical analysis . . . . . 3100 ppm dissolved solids
Product water chemical analysis . . . . . 450 ppm
Electric energy consumption . . . . . 15 kwh per 1000 gallons
Daily capacity—present . . . . . 28,800 gallons per day
Daily capacity—final . . . . . 86,400 gallons per day

The electric membrane plants remove salt, hardness, alkalinity, gypsum, epsom salts, nitrate and fluoride from natural waters.

They operate continuously, automatically, economically.

They require no steam, no periodic regeneration, and leave no hard scale deposits.

For additional information, write Department O.

IONICS

IONICS, INCORPORATED, 152 SIXTH STREET, CAMBRIDGE 42, MASS.

OIL AND GAS JOURNAL

Showcase

- BULLETINS
- CATALOGS
- BROCHURES

Preparation of Petroleum Feeds for Platinum Catalysts is set forth in a new 12-page, 2-color booklet. It covers the development of sorptive minerals to provide protection for platinum catalyst reforming feed stocks. These special materials are available in a wide range to meet the needs of various process systems and conditions. The pretreating step protects against losses caused by catalyst poisoning by effectively reducing the constituents that foul the catalyst. Troublemakers removed from the stream include arsenic, tetraethyl lead, alkyl sulfur compounds, and nitrogen. **For more information write or call: Minerals & Chemicals Corp. of America, Menlo Park, N. J.**

●

Power Pipe Pushing for Rigid Pipe or Conduit, Flexible Pipe, Cable Pulling, Oversize Pipe, and Sewer Pipe. Presenting the Speed Thru pipe pusher, this 16-page booklet employs drawings to illustrate the uses of this machine. Uses include shoving pipe under pipelines, streets, highways, and railroads without trenching. The booklet gives tips on installation, operation, care, and maintenance of the pipe pusher and its power plant. The booklet explains that the power pusher is operated by one man and is hydraulically powered. **For more information write or call: Mercury Hydraulics, Inc., 2440 Blake Street, Denver 5, Colo.**

●

New Gas-Dehydrating Unit. A new gas-dehydration unit for gas wells utilizes calcium chloride pellets in a tower of patented design. It is described in a 16-page engineering report. **For more information write or call: The Fish Engineering Corp., P. O. Box 2617, M & M Building, Houston, Tex.**

●

Drain or Sampling Valve in Sizes to 2 In. Two-page Data Unit 294 details and features a new drain or sampling valve in sizes from ¾ up to 2 in. As described and illustrated the valve is available in a complete range of sizes to 2 in. in two types of construction according to size, both with constructions featuring a valve-steam seating outside the valve body and O.S.&Y.

construction to meet high temperature and corrosive conditions. Detailed specifications and engineering drawings are included. **For more information write or call: Jerguson Gage & Valve Co., 80 Fellsway, Somerville 45, Mass.**

•

Crystolon RC 2351 Air-Setting Cement, a two-page bulletin, sets forth information on how to mix and apply, either by hand or by spraying, this highly refractory cement. It is designed for use in incinerators, boilers and gas generators, and other high temperature applications where minimum slag buildup is essential. **For more information write or call: Norton Co., Worcester 6, Mass.**

•

De Laval Hydraulic Fan Drives for Air-Cooled Heat Exchangers and Cooling Towers are described in Bulletin 3009. The six-page, illustrated bulletin includes detailed information on the IMO motors and pumps and the worm-gear reducers that make up the fan-drive unit. Also included in the bulletin are performance curves useful for selecting the right unit for specific applications. **For more information write or call: De Laval Steam Turbine Co., Trenton, N. J.**

•

Clean Motors and Generators Quickly, Efficiently, and Safely with Turco-Solv. This new four-page folder A-28 describes Turco-Solv, a detergent-action safety solvent. Turco-Solv is designed primarily for the in-place cleaning of electrical equipment. It is also ideal for the hand wiping of small parts, for precleaning prior to flaw-detecting operations, for grease pencil, chalk, or ink removal, as well as other cleaning jobs incident to plant maintenance. The compound is nonconductive, evaporates to complete dryness without leaving a residue, requires no rinsing, and is safe on all metals, paint, and varnishes. The folder contains three charts which cover toxicity, flash point throughout evaporation cycle, and evaporation rate of Turco-Solv as well as other commonly used cleaning solvents. Also included are a number of established uses for safety solvents. **For more information write or call: Turco Products, Inc., 6135 South Central Avenue, Los Angeles 1, Calif.**

•

Dravo Products and Services for the Oil and Gas Industry are presented in a new 20-page booklet. Bulletin 1704 illustrates many pipeline pumping and compressor stations that have been engineered and constructed by the corporation, including metering and regu-

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but extremely SENSITIVE!

PARTLOW TEMPERATURE CONTROLS are built to withstand rough usage, but they're also extremely sensitive to slightest temperature changes. They'll take a lot of punishment without upsetting their accuracy and precision.

If your process requires precise temperature control in the –30°F to 1200°F range, you can do it better . . . *and at lower cost* . . . with Partlow Controls.

They're less complicated than thermocouples. Thick-walled capillaries and seamless tubing assure almost indefinite life. Elements can be replaced on the spot.

What's your control problem?

Tell it to Partlow!

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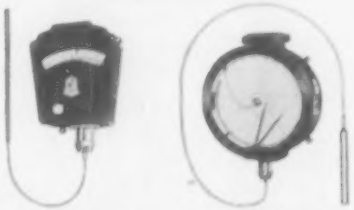
New Hartford, N. Y.
Offices in All Principal Cities

SEND FOR THIS FREE CONDENSED CATALOG



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Indicating Temperature Control

MODEL RS
Recording Temperature Control

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the pioneer in mercury thermal controls

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HARRISBURG STEEL CORPORATION
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Forged Steel Flanges and Seamless Welding Couplings.

VOLCANO BURNER COMPANY
Houston, Texas
Volcano Superior and Gulf States All Steel Gas Burners for OIL COUNTRY BOILERS.

LOS ANGELES BOILER WORKS
Los Angeles, California
Welding Caps—Dished & Flanged Heads.

WESTERN SAFETY BARREL STAND
Houston, Texas
Stand lifts, holds, tilts 55 gal. barrels Prevents spillage—easily loaded.

MILLS IRON WORKS, INC.
Los Angeles, Calif.
Seamless Swage Nipples, Bull Plugs & Welding Reducers.

WHEELING MACHINE PRODUCTS CO.
Wheeling, West Virginia
XL Steel Pipe Couplings for OIL COUNTRY TUBULAR PRODUCTS.

lating stations. In addition, it shows numerous shop-fabricated station and system piping applications. Coverage is also given to Dravo's fabricating plant facilities. **For more information write or call: Dravo Corp., Neville Island, Pittsburgh 25, Pa.**

•

Columns of Glassed-Steel and Alloy Construction in both tray and packed design are described in the new eight-page Bulletin 940. It details the design and construction of columns for fractionation, stripping, absorption, extraction, and chemical reactions. It illustrates a number of basic designs: bubble cap tray, sieve tray, Turbogrid tray, or packed columns. Due to high efficiency and capacity per unit volume, the tray column is more adaptable to continuous processing. The bulletin offers standard packed, glassed-steel columns from 2 to 48 in. in diameter with larger sizes supplied on a custom basis. **For more information write or call: Pfaudler Co., 1020 West Avenue, Rochester 3, N. Y.**

•

Stran-Steel Building Catalog presents an enlarged line of industrial buildings and accessories. The 4-color, 20-page brochure features a new series of rigid-frame structures, two 50 and 60-ft. bowstring truss buildings, and the recently developed Stran-Satin metal wall. Using perspective and plan drawings, the catalog illustrates rigid-frame buildings available in widths of 32, 40, 50, 60, 70, and 80 ft., or multiples of those widths, in bays, 20 ft. long. The bowstring truss structures, 50 and 60 ft. wide, are available in 16-ft. bays. Multiples of these buildings may be obtained with either 16 or 32-ft. interior column spacing. The catalog illustrates close-up details of various accessories for the buildings. **For more information write or call: Stran-Steel Corp., Detroit 29, Mich.**

•

Seeco-Mul Drilling Mud Emulsifier, a new eight-page, technical bulletin describes Seeco-Mul as a comparatively new emulsifying compound widely used on the Gulf Coast and in West Texas. The bulletin contains maintenance costs and performance comparisons of Seeco-Mul emulsifier mud systems and conventional emulsion muds, chemical analyses of the compound, and other mud engineering data. The text of the literature also lists operating advantages of the emulsifier, a wood products derivative. **For more information write or call: Crossett Chemical Co., P. O. Box 271, Crossett, Ark.**

EQUIPMENT MEN . . . in the News

Dewey Supply Names Winans Southern District Manager

The appointment of R. D. Winans as southern district manager has been announced by M. B. Roach, president of Dewey Supply Co. Winans will continue to serve as sales representative in the Oklahoma City office and will also be in charge of the Ada and Chickasha sales stores.

Dewey Supply Co., with main offices in Tulsa, has other sales outlets in Tulsa, Bartlesville, and Dewey, Okla.

Franks Division Names Tinsley as Export Manager

F. H. TINSLEY

Fred H. Tinsley has been named export manager for Franks Division, Cabot Shops, Inc., R. A. Baker, vice president and general manager, has announced in Tulsa.

Tinsley was promoted from ordnance plant superintendent of Cabot Shops, Inc., in Pampa. He has been with the company 19 years.

With headquarters in the Franks Division Tulsa office, Tinsley will be in charge of sales and service for Franks pulling units and Franks drilling rigs in the international market.

National Appoints Public Relations, Ad Director

G. B. CUSHING

George B. Cushing has been appointed director of public relations and advertising for The National Supply Co., Pittsburgh, it has been announced by A. W. McKinney, president. Cushing has been manager of sales promotion for the firm since 1946, directing advertising, publicity and market development. For the last 6 years he has also headed the company's personnel recruiting and training activities. He will continue in charge of these programs.

McKinney said the appointment "reflects Cushing's increased responsibilities of furthering improved relations with our stockholders, employes, customers and the general public."

Prior to joining The National Supply Co., Cushing was with A. M. Byers Co. and Westinghouse Air Brake Co.

Six Baroid Departments Promote and Transfer

R. W. WILSON

R. W. Wilson has been named assistant manager, technical sales and operations, for Baroid Division, National Lead Co. R. E. Souther has been appointed manager of the well-logging department, replacing Wilson. P. J. Moore succeeds Souther as manager of the equipment department.

C. J. Benefiel is manager of the transportation department with head-

R. E. SOUTHER

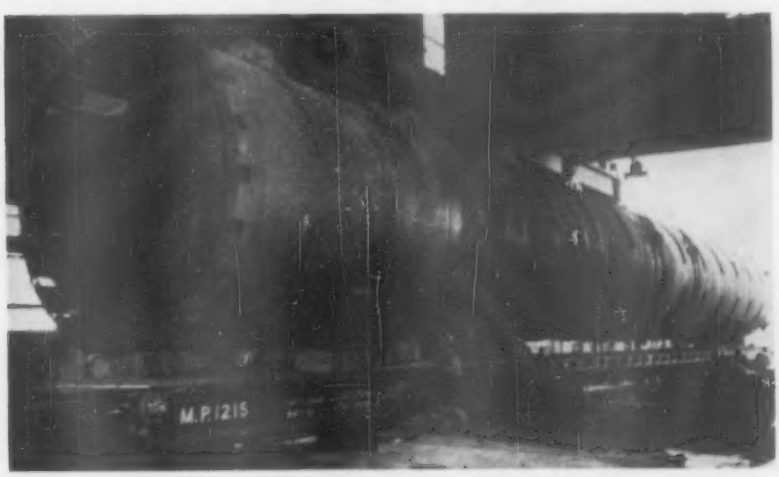
P. J. MOORE

quarters in Houston. William J. Miller has joined the equipment department as pilot-engineer and will devote a portion of his time to the engineering section of the department as a project engineer. C. W. Felker has been appointed district superintendent of District 51 at Lake Charles, La.

W. G. Bealmear, S. E. Geffen, and J. W. Maltby have been appointed area superintendents of well logging in Southwest Texas, Mid-Continent and eastern Gulf Coast areas. A. B. Lane has been named well-logging district superintendent in Southwest Louisiana at Lafayette.

Well logging Captain C. L. Apple, Jr., formerly stationed in British Honduras, has been made well-logging district superintendent of northern Louisiana, Arkansas, and East Texas with headquarters in Shreveport. R. E. Haley, well-logging district superintendent, has been transferred from Shreveport to Oklahoma City where he will supervise well-logging operations in all of Oklahoma except the panhandle.

D. B. Reeves has been appointed district superintendent in Kansas and the panhandle sections of Texas and Oklahoma. His assistant will be T. W. English. V. R. Kayser has been made well-logging district superintendent in South-



Delta Ships Debutanizer Tower for Phillips Project

This 13-story-high debutanizer tower, destined for a new Phillips Petroleum Co. project at Sweeny, Tex., is shown before leaving main plant of Delta Tank Manufacturing Co., Inc., in Baton Rouge, La., where it was fabricated for Stone & Webster Engineering Corp. Built in one piece and loaded aboard three railway flat cars, the pressure vessel was stress-relieved in two sections in Delta's 75-ft.-long gas-fired furnace before leaving the Baton Rouge plant. The two end cars of the three-car nest were equipped with swivel bolsters to enable the tower to clear obstructions on track curves. Measuring 13 ft. in diameter, the 126-ft.-long tower weighs 222,756 lb.

west Texas, with headquarters in Corpus Christi.

The new mud department district office in Houma, La., will be supervised by G. G. Allen. His successor as area engineer in the Texas Gulf Coast is R. K. Epps. V. S. Hefley has been appointed district sales representative of mud department District 44 at Corpus Christi.

Donald C. Lamm has joined Baroid's advertising staff as assistant to the manager. Lamm's duties will be primarily in the production and graphic arts field. Stanley W. Hoig has also joined the advertising and publications staff as assistant to the manager. His duties will be primarily in the editorial field.

S. R. Bowen Operations in Canada Headed by Erwin

W. C. ERWIN

The appointment of W. C. Erwin as general manager of Canadian operations has been announced by Paul Bowen, president of S. R. Bowen Co. The Bowen company has established headquarters at Edmonton and will establish stores in outlying locations to better serve customers in western Canada.

Erwin is one of the pioneers in the development of rotary drilling. He first became associated with a fishing-tool service organization in 1933. Recently he served as the western division general manager in charge of operations in the West Coast, Rocky Mountain, and Canadian operations of a large service organization.

Maloney-Crawford Elects Officers

Maloney-Crawford Tank & Manufacturing Co., Tulsa, announces the election of M. R. Liles to president and chief executive officer; T. J. Latta to the position of treasurer; S. P. Wallace to the newly created post of chairman of the board; F. L. Bruckner, vice president and secretary; L. G. Rader, vice president in charge of sales; and E. C. Kopp, vice president.

The company is engaged in the manufacture of oil-field equipment consisting of bolted steel tanks, welded steel tanks, emulsion treaters and heaters, oil and gas separators, steel walkways and stairways, gas dehydration equipment, pressure vessels, and other items used in the production of oil and gas and in the chemical industry.

Pittsburgh Coke Appoints Coatings Representative

Autrey Z. Partain has been appointed a sales-service representative for the protective coatings division of Pittsburgh Coke & Chemical Co. He will work out of Tulsa, providing technical service and assistance for sales personnel throughout the United States.

Prior to joining Pittsburgh Coke, Partain was with Stanolind Oil & Gas Co. working in that firm's research laboratory. He also worked with protective coatings for S. E. Bosley Co.

Reese Named Special Representative by Western

The appointment of T. Deal Reese as special representative to the process industries has been announced by F. Wilson Dye, president of Western Supply Co. of Tulsa.

Reese's duties with Western will include special assignments in expanding the firm's Houston-area coverage, with particular emphasis on the refining, petrochemical, chemical, and pipeline industries. He will headquarter in Houston in the company's offices in the San Jacinto Building.

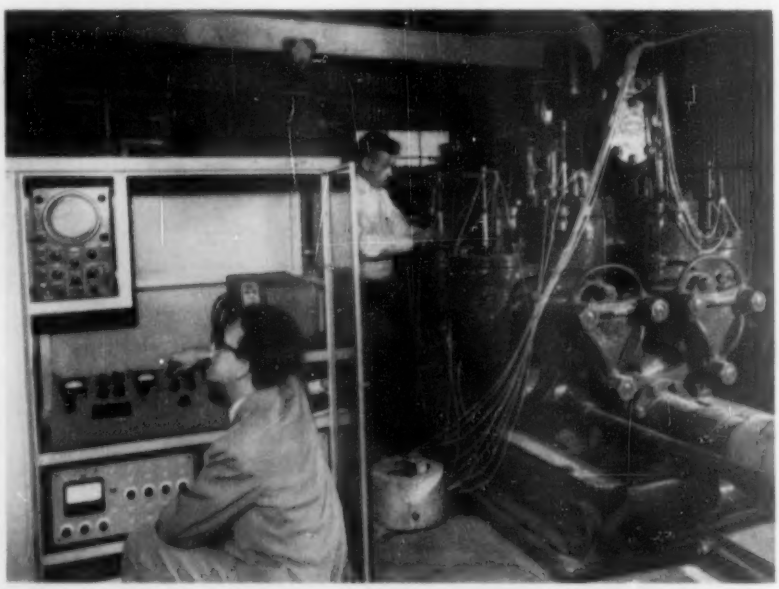
Simultaneously, Reese announced his resignation as vice president and regional sales manager for Gulf Supply Co., Inc., with which firm he has been associated since opening its Houston office in 1947.

J. A. Kappele Joins Kappele Engineering

J. A. KAPPELE

J. A. (Jerry) Kappele, formerly with Humble Oil & Refining Co., has joined his father's firm, Kappele Engineering Co., as head of the firm's Tulsa office. Kappele Engineering Co. is the manufacturer's agent in Oklahoma and part of Kansas and Arkansas for Gearench Co. Petol tongs and tools, Leslie Co. reducing valves, Nicholson steam traps and Marshalltown gages. M. T. Kappele, president, will continue to manage the company and reside in Ponca City.

J. A. Kappele has been with Humble 8 years in the maintenance engineering department at the company's Baytown refinery.



Mission's New Device Analyzes Pump Parts

Mission Manufacturing Co., in its main plant in Houston, has developed an electronic device to keep tab on slush pump parts: how they operate, where points of stresses are, what parts should be redesigned or strengthened. Engineers at Mission have discovered some hitherto unknown facts about the action of pump parts through use of their 14-channel recording oscillograph.

An oscillograph is hooked to various parts of the pump being tested. Signals from these various pickups are fed to amplifiers in the instrument cabinet in the left foreground.

Mission Manufacturing Co. established this research program to meet the future needs of the industry. With the accurate information thus obtainable, engineers will have a more solid basis for designing new equipment and revamping existing slush pump parts.

Homco Method Is Due for Italian Oil Fields

Emilio Copertini, Italian petroleum engineer, has been in Houston for 3 months studying and working with Houston Oil Field Material Co.'s directional drilling and oil-well-surveying tools.

Shown are: Homco's George E. Justice, L. H. Galeener, Copertini, and Homco's A. W. Waddill.

Copertini is associated with Azienda Generale Italiana Petroli. Prior to coming to the states and beginning his tour with Homco, he spent his oil-field time in Cortemaggiore, Italy. Upon his return, he will office in Caviaga.

Chenault Joins Badger As Houston Manager

Bert R. Chenault has joined Badger Manufacturing Co., Cambridge, Mass., as sales engineer and manager of the firm's new Houston office. Prior to his association with Badger, Chenault was employed as a design engineer by Air Preheater Corp. as a process engineer by Magnolia Petroleum Corp. and as a sales engineer by Lummus Co.

Chenault will represent Badger's engineering division in the Southwest area. The new Houston facility is the fourth sales office maintained by the company. Others are in New York City, The Hague, and at the home office in Cambridge.

Welex Appoints Five Sales Engineers in Southwest

George C. Thomas has been named Oklahoma division sales engineer for Welex Jet Services, Inc.; A. O. Jones has been appointed district sales engineer at Shawnee, Okla.; Kenneth R. Stout has been named district sales engineer at Great Bend, Kans.; Kenneth F. Simmons has been named sales engineer at Duncan, Okla.; and Curtis L. Crenshaw has been appointed sales engineer at San Angelo, Tex.

Thomas will headquarter in Oklahoma City. Starting with Welex 3½ years ago, he has advanced to sales engineer, assistant district manager, and district manager prior to his present appointment. Jones has been with Welex for the past year and has had 9 years' experience in oil-field service work.

Stout has been with Welex 16 months and was a shooter prior to this appointment. Simmons and Crenshaw have been with Welex 4 years and have held positions as riggers and shooters prior to their present appointments.

ElectroData Division Names Lamar, Ladwig

Yougene J. Lamar has been appointed manager of product planning for the ElectroData Division of Burroughs Corp., Pasadena, Calif., and Frank W. Ladwig has been named manager of market development, according to James R. Bradburn, Burroughs vice president.

Lamar will be responsible for evaluating new ideas in the electronic data-processing field and recommending to management the expansion of present ElectroData product lines and the addition of new ones. Lamar joined Burroughs in 1938 where he held a variety of positions, including sales representative, supervisor of systems studies, and coordinator of product planning for Series E equipment.

Ladwig will be responsible for the

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analysis of commercial and scientific computer problems, as well as the development of new applications and markets for ElectroData's three computing products: Datatron high-speed electronic digital computers, Series E desk-size computers, and Series G high-speed printing, tabulating, and punch-card equipment. Ladwig has held a variety of positions with Burroughs Corp. since 1940, including sales representative, zone sales manager in Boston, manager of the special machines department, and manager of the computer section. He organized the first Series E computer marketing group in 1954.

Continental Supply Named Jordan-Rogers Distributor

The appointment of Continental Supply Co. as distributor of Jordan-Rogers PVC plastic pipe has been announced. The agreement gives Continental exclusive distributorship of the complete line of high impact PVC plastic pipe for oil-country use in Canada and the United States, except in the states of California, Oregon and Washington.

George Runnels is manager of the pipeline equipment division, Continental Supply Co. Ted Anderson is newly appointed Mid-Continent pipe sales manager for Jordan-Rogers.

Continental with headquarters in Dallas, has supply stores or representatives in all principal oil fields. The Jordan - Rogers plant is located in Orange, Calif.

Brown Fintube Co. Announces Promotions

J. R. BLAKESLEE

J. R. Blakeslee, formerly sales manager, has been promoted to the position of vice president, heat exchanger sales, Brown Fintube Co., Elyria, Ohio; E. J. Skiba, formerly chief engineer, is vice president, engineering design; George Clarke, formerly design engineer, has been named assistant chief

E. J. SKIBA

GEORGE CLARKE

engineer, gas equipment; and Douglas Towers, formerly assistant chief thermal engineer, has been appointed chief

D. TOWERS

C. B. THAW

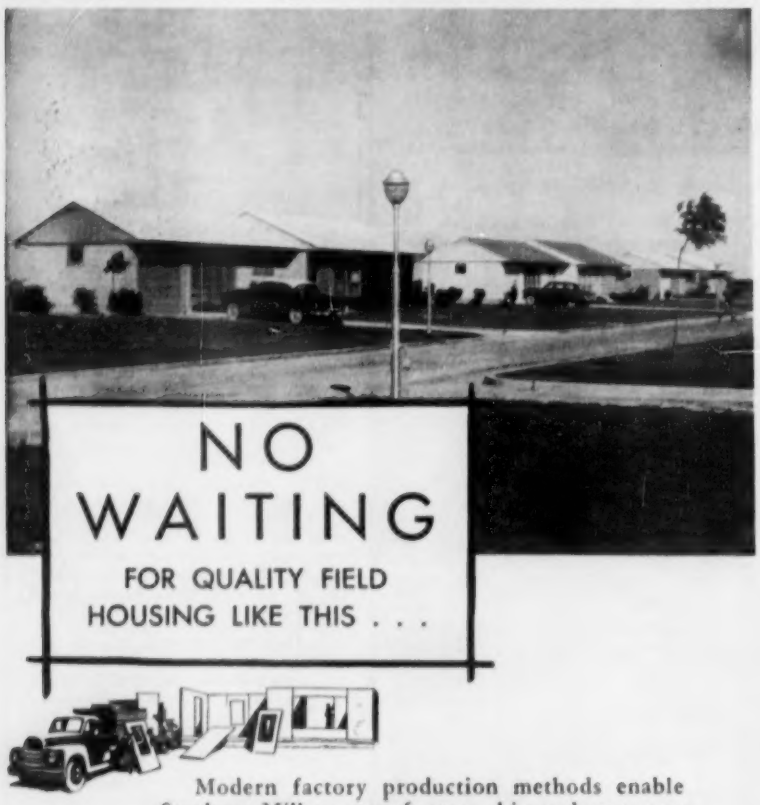
thermal engineer. These appointments were announced by John W. Brown, Jr., president of Brown Fintube.

C. B. Thaw, president of C. B. Thaw Co., Philadelphia, is a newly elected member of the board of directors.

Magcobar Appoints Weil As Advertising Manager

The appointment of Ben Weil as advertising manager for Magnet Cove Barium Corp. has been announced by Willard Johnson, president.

Weil has had many years of experience in oil-industry advertising, both as an advertising manager and account executive.



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STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

Roots-Connersville Names Western Office Head

Roots-Connersville Blower Division of Dresser Industries, Inc., Connersville, Ind., has established a San Francisco sales office in the Balboa Building, San Francisco, Calif. Arlie E. Caudle will head the new office, according to an announcement by D. A. Johann, vice president. Caudle will be responsible for the organization and management of the San Francisco sales territory which includes the counties in central and northern California and western Nevada.

Caudle has been with Roots-Connersville for over 10 years, serving first as chief application engineer and then as manager of engineering.

Bethlehem Appoints Howell Machinery Sales Engineer

The appointment of Charles M. Howell as machinery sales engineer has been announced by Wendell M. Jones, vice president of Bethlehem Supply Co., Los Angeles.

Howell had previously been associated with the Bethlehem Supply organization in machinery sales but left the company in 1948 to become southern California representative for Detroit Diesel Engine Division of General Motors in petroleum-industry sales. While with this organization, he was transferred to Tulsa as assistant manager of petroleum-industry sales where he has worked for the last 3 years.

Continental Names Two To New Positions

R. E. Scheibel will fill the newly created post of division merchandise manager in Continental Supply Co.'s Houston office, and B. P. Burrage will step into the post of training coordinator. This new position is in addition to the personnel department.

Scheibel joined the company in 1946 and has held the positions of bookkeeper, store manager, sales representative and manager of Continental's pipeline equipment division. Burrage, former production equipment specialist at Great Bend, Kans., has been with Continental 11 years. He will be located in Continental's home office in Dallas.

BJ Service Appoints Daggett and Ludwig

W. K. Daggett has been appointed sales supervisor at BJ Service, Inc., and C. W. Ludwig has been promoted to the position of sales supervisor at Hobbs, N. M., according to Frank Smith, vice president in charge of sales.

Daggett will direct the sales development of new products and services for BJ Service's Texas division, from his headquarters in Odessa. Ludwig recently completed advanced training at the company's main office in Long Beach.

BJ Service personnel recently moved into new, improved facilities in Kimball, Neb., it has been announced by W. T. Box, vice president in charge of operations. In addition to this modern shop and office buildings, a new bulk cement plant and bulk sand plant provide loading and blending facilities.

Daggett was formerly with Welex Jet Services, Inc., as sales manager and supervisor of sales training. Ludwig joined BJ Service in 1951 as an equipment operator and has held the positions of service engineer, sales engineer and station supervisor.

B & W Transfers Wood

Luther Wood, B & W, Inc., has been transferred from Harvey, La., to Laurel, Miss., to handle delivery and field-service requirements for that area and for Citronelle, Ala. B & W manufactures a complete line of primary cementing tools for the petroleum industry.

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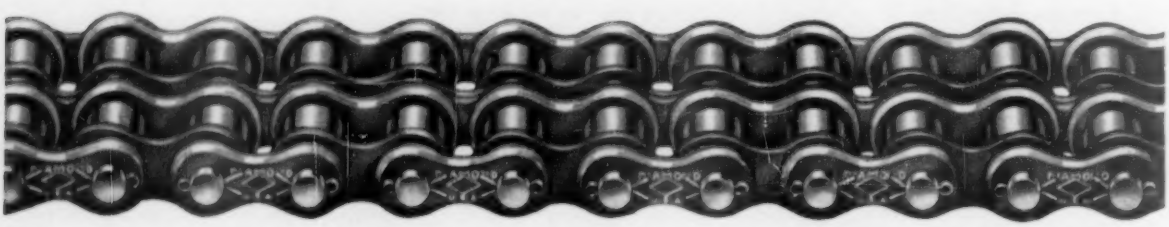


Arizona Bids for Fresh Interest

by Frank J. Gardner

Arizona's four commercial wells indicate a rosy future for the state, as oil-finding interest perks up in the Four Corners region.

THE stepchild of the Four Corners region is and always has been . . . Arizona. But in all the excitement of discovery in southeastern Utah and northwestern New Mexico, oil finders must not lose sight of the important and less-heralded events in the Grand Canyon state.

The finishing of Arizona's first well in late 1954 made news in a big way, as the state became our thirtieth on the productive list. Shell Oil Co. 2 East Boundary Butte (Section 3-41n-28e) made a gas-condensate discovery from Hermosa rocks at 4,540-4,690 ft. with a potential of 3,150 M.c.f. gas, 3.6 bbl. of light oil, and 8.4 bbl. of water per day to become the first commercial strike in Arizona. Previously, Shell had drilled its 1 East Boundary Butte in Section 6-41n-29e, east of the discovery well, and it looked for a time as if it would be commercial, but production tapered off to a point of abandonment.

Triple threats . . . A year later, in 1955, Humble Oil & Refining Co. brought in the first oil well, its 1 Navajo in Section 4-41n-28e. Not only was it the first oiler, but it opened a new pay at 4,800 ft. in the Paradox member of the Hermosa, and made commercial gas and oil tests in the Mississippian at 5,570-82 ft. In the original Hermosa pay found by Shell, the Humble well tested 4,385 M.c.f. of gas per day, to score as a triple-threat discovery.

Now, in late 1956, two new strikes emphasize the growing importance of the Arizona play. Only a mile west of the New Mexico line (see map), El Paso Natural Gas Co. and Stanolind Oil & Gas Co. have registered a lower Hermosa flow of 20,800 M.c.f. per day at a new gas field known as Bita Peak (Section 19-41n-31e); previously, the well had tested 8,300 M.c.f. from the Paradox member at 5,049-5,105 ft. The lower Hermosa flow came from 5,500 ft. Again, a dual strike for Arizona. The well is not yet finished and has been shut in.

Just south of East Boundary Butte, a third field has been opened at North Toh-Atin. Here, Franco-Western Oil Co. completed its 1 Navajo (Section 22-41n-28e) for 7,450 M.c.f. gas and 18 bbl. of condensate per day from the Paradox at 5,359-67 ft.

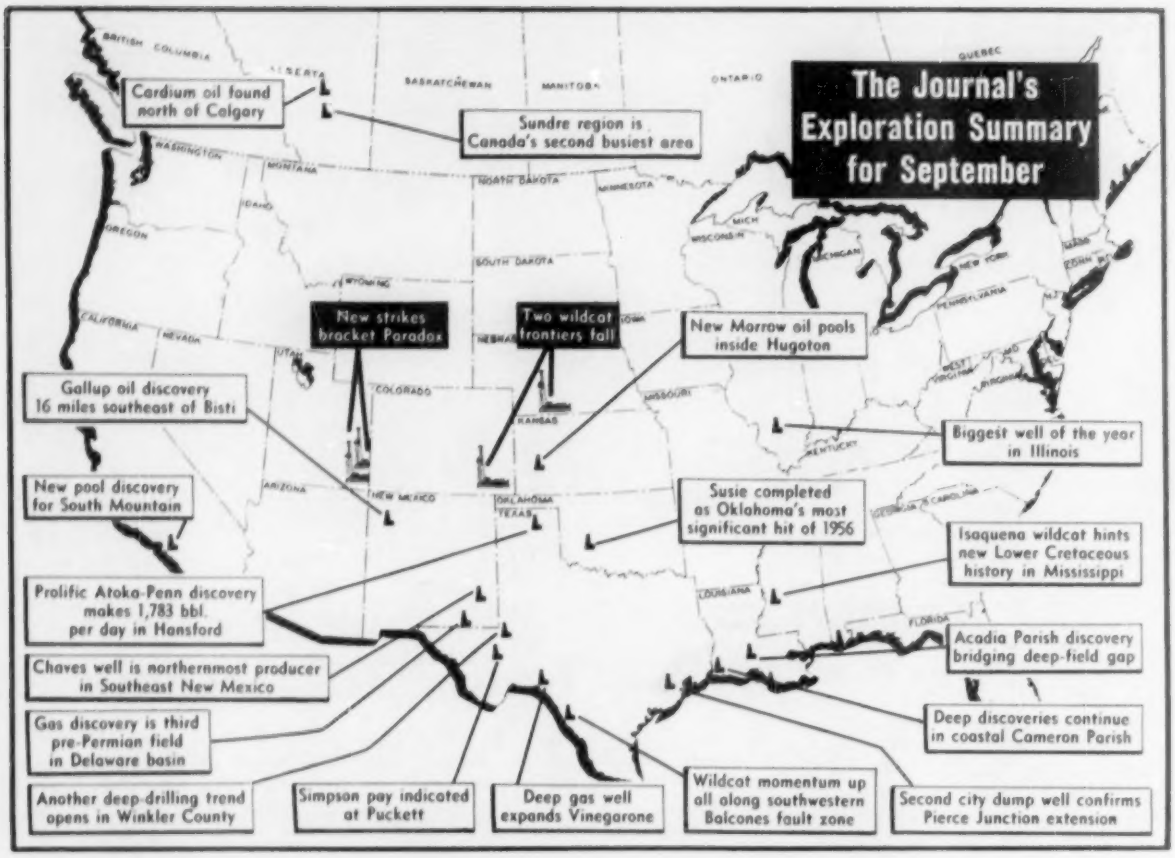
And things to come . . . All this has happened in the northeastern corner of the state in Apache County. It is a reflection of the active campaigns now going on in other parts of the southern Paradox basin. But you can mark it down in your little black book that before many months, the Arizona portion of this vast basin will rival these other plays in intensity, especially if someone gets a really big oil well in the Paradox or Hermosa. Then, too, there's a possibility of Upper Cretaceous oil here, at depths even shallower than the hot Gallup sand play of northwestern New Mexico.

The great promise of the Black Mesa basin, south and west of the current Paradox drilling, must never be overlooked in evaluating Arizona's oil future. Here is a 10,000-sq. mile basin offering 6,000,000 acres of excellent oil targets at reasonable depth, and a drilling density of one wildcat per 2,000 sq. miles. There are surface anticlines galore, a thick section of marine sediments (representing a fairly complete geologic section), and a continuous record of excellent oil and gas shows in the wells that have been drilled. Most drilling activity so far has been confined to the southern rim of the basin, and of its deep center we know practically nothing. Besides the numerous surface structures, the subsurface should logically harbor myriad strat traps not unlike those of the Paradox bowl.

On Pinta anticline, a 30,000-acre uplift east of Holbrook, Ariz., several wells have been sunk, and most of them recorded good showings; one of these found helium gas reported to have had the highest helium concentration ever found in America. Now, Kerr-McGee Oil Industries, Inc., has revealed plans for a new test of the structure in Section 34-20n-26e; this, too, is in Apache County, and if the operators should make a successful completion here, all Hades will break loose in Arizona.

Point to a glowing future . . . When the lease play comes, you might be interested to know that only 18 per cent of Arizona is privately owned. The federal Government owns 49,672,000 acres, or 41.65 per cent, and the state itself owns 13.7 per cent, while the remaining 26.65 per cent is in trust for the various Indian tribes.

Watch this state. Its oil future looms big, despite prior prejudices on the part of oil finders. It may be a stepchild now, but remember . . . so was Cinderella.


The Journal's Exploration Summary for September
Cardium oil found north of Calgary
Sundre region is Canada's second busiest area
New strikes bracket Paradox
Two wildcat frontiers fall
New Morrow oil pools inside Hugoton
Gallup oil discovery 16 miles southeast of Bisti
Biggest well of the year in Illinois
New pool discovery for South Mountain
Susie completed as Oklahoma's most significant hit of 1956
Isaquena wildcat hints new Lower Cretaceous history in Mississippi
Prolific Atoka-Penn discovery makes 1,783 bbl. per day in Hansford
Acadia Parish discovery bridging deep-field gap
Chaves well is northernmost producer in Southeast New Mexico
Deep discoveries continue in coastal Cameron Parish
Gas discovery is third pre-Permian field in Delaware basin
Another deep drilling trend opens in Winkler County
Simpson pay indicated at Puckett
Deep gas well expands Vinegarone
Wildcat momentum up all along southwestern Balcones fault zone
Second city dump well confirms Pierce Junction extension

Falling completions offset as . . .

Paradox, Mid-Continent Bastions Totter

by John C. McCaslin
District Editor

DESPITE the nationwide drop in well completions during September, exploration success continued to march across the country's oil provinces, both old and new. Three of the most youthful of producing areas commanded most of the month's exploratory interest—the Las Animas and Cambridge arches, and the Paradox basin. The long-awaited trek into the oil-barren Las Animas and Cambridge arch country has begun in real earnest, and with success. The Paradox basin turned up three discoveries of high-level importance, making it still the hottest drilling locale in the United States.

Arch hopes rewarded . . . Mid-Continent and Rocky Mountain oil hunters have been keeping a keen watch on wildcats testing the secrets of the Las Animas and Cambridge arches this year. The long watch is bringing results.

Three new oil fields have opened up on the Cambridge arch of Nebraska and Kansas in the past 4 months. This is a real success story when you consider that a year ago there was only one pool on the entire regional structure. Two of the fields are in Decatur County on the Kansas side, the other in Red Willow County, Nebraska. All three fields are enjoying development success, and wildcatters are beginning to push up the lengthy Mid-Continent structure in both states.

. . . On Las Animas. Sporadic drilling on the Las Animas arch of southeastern Colorado in the past few years uncorked only one small gas area at McClave. Last year a basal Pennsylvanian oil and gas discovery at Bent's Ford in Bent County shook the dust off a sleepy exploratory program in this region. This year the drill has been working the arch with gusto, and not without reward.

In September, D. D. Harrington completed the 1-A Earl in Bent County for 10,000 M.c.f. of gas per day in the lower Pennsylvanian sands. In Kiowa County the same operator tested oil shows in the Marmaton lime-Pennsylvanian in the McClave gas area. Other tests are planned for this boundless wildcat country. In extreme western Kansas on the eastern edge of the Las Animas arch first production was established in both Wallace and Greeley counties.

The recent discoveries on the Las Animas arch and its environs are not world-shaking in their potentials, but

Total September Completions, Exploration and Development

	Total completions					Total wildcat wells					Cable tool comp.	Active operations
	Total	Oil	Gas	Dry	Footage	Total	Oil	Gas	Dry	Footage		
Alabama	5	2	0	3	44,272	3	0	0	3	21,307	0	16
Arizona	1	0	1	0	5,900	1	0	1	0	5,900	0	1
Arkansas	101	68	1	32	280,367	18	1	1	16	66,986	3	95
California	196	140	3	53	916,776	60	10	3	47	324,729	4	202
Colorado	107	20	4	83	230,116	72	2	0	70	355,570	0	131
Florida	1	0	0	1	6,868	1	0	0	1	6,868	0	5
Illinois	295	136	3	156	668,271	51	3	0	48	110,430	81	482
Indiana	64	26	0	38	102,726	12	1	0	11	17,328	38	90
Kansas	339	141	41	157	1,195,514	82	10	7	65	320,146	45	386
Kentucky	170	65	15	90	252,715	31	3	0	28	43,665	132	241
West	153	65	0	88	202,895	30	3	0	27	41,074	115	191
East	17	0	15	2	49,820	1	0	0	1	2,591	17	50
Louisiana	282	149	33	100	2,070,637	49	11	2	36	492,413	0	442
North	141	82	16	43	514,662	16	1	0	15	90,397	0	144
South	115	57	13	45	1,291,894	29	9	2	18	347,135	0	242
Offshore	26	10	4	12	264,081	4	1	0	3	54,881	0	56
Michigan	33	11	2	20	94,361	19	1	0	18	53,960	22	109
Mississippi	38	8	1	29	261,876	23	1	0	22	156,302	0	39
Montana	55	33	1	21	269,406	19	0	0	19	87,273	18	97
Nebraska	59	21	0	38	339,136	29	4	0	25	164,408	2	52
West	57	20	0	37	334,520	29	4	0	25	164,408	0	45
East	2	1	0	1	4,616	0	0	0	0	0	2	7
New Mexico	137	48	56	33	601,816	21	2	1	18	102,520	12	212
Northwest	88	16	56	16	360,866	11	2	1	8	43,982	0	95
Southeast	49	32	0	17	240,950	10	0	0	10	58,538	12	117
New York	52	23	1	28	73,831	0	0	0	0	0	52	24
North Dakota	20	14	0	6	156,603	5	0	0	5	23,182	0	32
Ohio	102	61	18	23	241,090	4	2	1	1	14,913	100	173
Oklahoma	540	298	12	230	1,879,791	72	12	2	58	333,143	83	843
Pennsylvania	22	0	22	0	107,517	3	0	3	0	19,174	16	53
Texas	1,594	935	68	591	6,842,441	425	60	15	350	2,072,873	107	1,243
Southwest (1)	119	77	1	41	274,959	36	6	0	30	101,574	4	90
Gulf Coast (2)	60	28	7	25	347,770	18	2	1	15	109,602	0	40
Gulf Coast (3)	145	67	9	69	1,079,756	56	3	3	50	466,239	0	100
Southwest (4)	97	31	16	50	503,122	50	7	4	39	264,282	0	54
East (5 & 6)	90	56	3	31	424,031	24	1	0	23	110,943	0	104
West Central (7-B)	223	124	4	95	721,322	73	14	1	58	236,730	32	149
West (7-C & 8)	409	319	2	88	2,145,216	57	10	0	47	382,624	32	501
North (9)	362	178	4	180	977,196	101	14	3	84	332,846	39	107
Panhandle (10)	89	55	22	12	369,069	10	3	3	4	68,033	0	98
Utah	11	5	2	4	59,275	5	0	1	4	23,038	0	45
West Virginia	68	8	51	9	189,393	5	0	4	1	26,864	68	229
Wyoming	78	33	5	40	315,926	32	5	1	26	130,828	7	198
Total September 1956	4,370	2,245	340	*1,785	17,506,624	1,042	‡128	42	872	4,973,820	790	5,440
Total August 1956	5,692	2,995	420	2,277	22,314,557	1,285	128	32	1,125	6,013,716	1,091	5,293
Cumulative 1956	43,870	23,795	3,023	17,052	177,087,546	9,719	1,242	320	8,157	46,466,287	7,218	
Cumulative 1955	42,581	23,984	2,626	15,971	169,683,318	9,149	1,389	272	7,488	43,845,040		
Western Canada	339	241	23	75	1,551,114	71	13	10	48	356,713		
Alberta	156	111	13	32	826,271	26	5	5	16	162,301		
Saskatchewan	145	108	0	37	596,597	35	8	0	27	136,654		
Manitoba	28	22	0	6	64,549	5	0	0	5	17,545		
British Columbia	10	0	10	0	63,697	5	0	5	0	40,213		
Alberta cum. 1956	1,410	1,060	95	255	7,612,952	267	46	36	185	1,569,121		
Saskatchewan cum. 1956	736	532	5	199	3,069,463	203	52	0	151	877,063		
Manitoba cum. 1956	169	132	0	37	393,582	31	3	0	28	95,508		
British Columbia cum. 1956	40	3	25	12	239,806	22	0	10	12	148,822		
Canada cum. 1956	2,355	1,727	125	503	11,315,803	523	101	46	376	2,690,514		

*Incl. 62 service wells: Ind. 1, Kans. 7, W. Ky. 1, N. Y. 23, Ohio 4, Okla. 23, N. Tex. 3. ‡Incl. 27 dist. wells: N. La. 1, S. La. 9, La. offshore 1, Okla. 6, Tex. (1) 1, Tex. (2) 4, Tex. (3) 4, E. Tex. 1. ‡Incl. 8 dist. disc.: La. 6, S.W. Tex 1, Gulf Coast 1.

they go to show that a virgin wildcat territory has been neglected much too long. The oil strikes on the Cambridge arch have all had good potentials, hinting that this sister structure to the Central Kansas uplift may yield many more oil fields. The tapping of the Las Animas and Cambridge arches this year is a mere dent in what we will see in the coming months.

Paradox pace quickens . . . The Four Corners region, consistently the hottest wildcat area in the country this year, turned up three more than important discoveries—Recapture Creek, North Desert Creek, and Navajo J.

Shell Oil Co.'s 1 Recapture Creek in San Juan County, Utah, flowed an estimated 350-700 bbl. of oil per day from the Paradox-Pennsylvanian to extend the Aneth trend 5 miles west. This Shell success is 6½ miles north of the 1,440-bbl. North Desert Creek discovery, another September Paradox-basin strike.

The Texas Co.'s 1 Navajo J flowed 3-4 bbl. of oil per hour, extending the Aneth "fairway" 9 miles to the east. The Recapture Creek and Navajo J wells appear to add stock to the theory that Paradox-basin oil will be found in definite trends or fairways.

September's fast-moving Paradox developments plus new Gallup success southeast of Bisti in neighboring New Mexico's San Juan basin draw most of the drilling interest from other areas. The Four Corners has attained top billing in the 1956 exploratory campaign.

As fall operations begin . . . Not all of the month's success was in the Rocky Mountain and Mid-Continent prov-

Completions By Depth Classifications, September 1956

	A 0-1,250 ft.	B 1,250-2,500 ft.	C 2,500-3,750 ft.	D 3,750-5,000 ft.	E 5,000-7,500 ft.	F 7,500-10,000 ft.	G 10,000-12,500 ft.	H 12,500-15,000 ft.	I Over 15,000 ft.
Alabama	0	0	1	1	0	0	2	1	0
Arizona	0	0	0	0	1	0	0	0	0
Arkansas	2	54	36	6	3	0	0	0	0
California	26	32	33	37	24	29	12	2	1
Colorado	3	2	11	39	46	5	0	1	0
Florida	0	0	0	0	1	0	0	0	0
Illinois	15	149	131	0	0	0	0	0	0
Indiana	29	22	13	0	0	0	0	0	0
Kansas	3	33	149	141	13	0	0	0	0
Kentucky	82	59	27	1	1	0	0	0	0
West	82	58	13	0	0	0	0	0	0
East	0	1	14	1	1	0	0	0	0
Louisiana	1	64	33	11	33	44	49	35	12
North	1	64	30	10	15	14	7	0	0
South	0	0	3	0	13	22	36	33	8
Offshore	0	0	0	1	5	8	6	2	4
Michigan	0	13	14	5	1	0	0	0	0
Mississippi	0	0	0	8	19	7	4	0	0
Montana	1	8	7	13	9	16	1	0	0
Nebraska	0	2	2	8	47	0	0	0	0
West	0	0	2	8	47	0	0	0	0
East	0	2	0	0	0	0	0	0	0
New Mexico	3	24	34	34	32	2	5	3	0
Northwest	0	15	25	17	31	0	0	0	0
Southeast	3	9	9	17	1	2	5	3	0
New York	0	50	0	2	0	0	0	0	0
North Dakota	1	0	1	0	2	15	1	0	0
Ohio	27	14	58	2	1	0	0	0	0
Oklahoma	60	119	190	83	55	25	6	2	0
Pennsylvania	0	1	7	3	11	0	0	0	0
Texas	186	315	281	300	287	154	44	27	0
Southwest (1)	57	21	18	12	8	1	2	0	0
Gulf (2)	3	2	4	16	16	19	0	0	0
Gulf (3)	6	1	8	13	37	55	20	5	0
Southwest (4)	4	12	12	12	40	15	2	0	0
East (5 & 6)	5	24	8	16	30	6	1	0	0
W. Central (7-B)	35	59	39	55	35	0	0	0	0
West (7-C & 8)	8	39	100	125	61	36	18	22	0
North (9)	68	150	35	46	52	10	1	0	0
Panhandle (10)	0	7	57	5	8	12	0	0	0
Utah	1	0	1	1	7	1	0	0	0
West Virginia	2	32	21	10	3	0	0	0	0
Wyoming	12	18	11	10	19	6	1	0	1
Total Sept. 1956	454	1,011	1,061	715	615	304	125	71	14
Total avg. 1956	606	1,514	1,395	812	782	386	126	63	8
Cum. 1956	4,196	10,530	10,718	6,821	6,448	3,191	1,276	595	95
Western Canada	2	46	44	146	76	21	4	0	0
Alberta	0	15	16	30	72	21	2	0	0
Saskatchewan	0	10	25	108	2	0	0	0	0
Manitoba	2	21	2	3	0	0	0	0	0
British Columbia	0	0	1	5	2	0	2	0	0
Cum. 1956	15	245	298	786	832	152	19	8	0

inces. Texas, Louisiana, Mississippi, Illinois, Oklahoma, New Mexico, and California all placed bids.

... In Texas. An increasing number of wildcats are starting all along the southwest extension of the Balcones fault zone in southwestern Texas—the objective being the deep Edwards lime. The Olmos sand play is spreading in Dimmit and Maverick counties. Sutton Petroleum, Ltd., confirmed an Olmos oil discovery in eastern Maverick, while Halbouty and Pronto Drilling Co. uncovered what appears to be another area with Olmos sand production 12 miles southeast in northwestern Dimmit County. Phillips Petroleum Co. completed another well in the deep-sand Vinegarone gas-condensate area of Val Verde County in the far southwestern part of Texas.

An extension well on the north side of Puckett field in southern Pecos County is creating a stir of interest with its new-pay possibilities, the Simpson sands. Pre-Permian drilling in the Emperor area of Winkler County near Wink has opened Devonian and Ellenburger production, molding a new deep-drilling trend for this West Texas area.

... In Louisiana. Coastal Cameron Parish, scene of a succession of deep gas and gas-condensate discoveries within recent years, added a new deep one just north of Creole.

The 4-mile gap between Northwest Branch and North Crowley fields in Acadia Parish was partly bridged with completion of Kilroy & Callery's 1 Heinan about midway between the two fields.

... In Mississippi. Promising oil showings were found in a Lower Cretaceous wildcat in southeastern Issaquena County at the upper west edge of Mississippi. Commercial success at this Amerada et al wildcat would mark a long northwestern extension of Lower Cretaceous production in the state.

... Illinois. The biggest well completed this year in the Tri-State region is Athene 1 Carson Scrivner, 2 miles northeast of Dahlgren in Hamilton County. The well flowed 114 bbl. of oil per hour from the Salem lime-Mississippian. Location is 1½ miles from other production.

... Oklahoma. The 1 Susie, the most significant discovery of the year for the state, was completed flowing 533 bbl. of oil in 18 hours on 18/64-in. choke from Bromide-Ordovician sands at 8,700-8,907 ft. The Sinclair Oil & Gas Co. discovery was drilled in an area of Caddo County in the southwestern part of the state that was first drilled 16 years ago. Susie's success commands a new look at the complex geological jungle just north of the Wichita Mountains.

... New Mexico. The northernmost oil prospect for Southeast New Mexico flowed wet gas on drill-stem test in the basal Pennsylvanian. The discovery is Charles Miller 1 State, Chaves County, 20 miles north of High Lonesome.

The third pre-Permian field in the Delaware basin was indicated at month's end at El Paso Natural Gas Co.'s 1-X Welch, 20 miles south of Carlsbad in Eddy County. The well flowed 100,000 M.c.f. of gas per day from Pennsylvanian sand. Despite much deep drilling throughout the Delaware basin, little pre-Permian production has resulted. The fields producing from deep zones in the basin are Bell Lake (Pennsylvanian and Devonian) and Toyah (Devonian).

... California. Shell Oil Co. scored what could prove to be another major Pliocene discovery in South Mountain field. The well, 1 Universal Harvey, was completed in a Santa Barbara zone pool, Pliocene age, north of the Oakridge fault. The well is more than 1,000 ft. north of Harvey zone production of South Mountain field, and almost ¾ mile northeast of the nearest Bridge area wells. Harvey production is from Sespe sands (Miocene) found on top the Oakridge fault, while both Bridge area and this new field are bottomed in Pliocene at depths greater than Harvey and Main zone production at South Mountain. Bridge area Pliocene oil is from Pico zones.

EXPLORATION HIGHLIGHTS

ARK-LA-TEX

ARKANSAS

September Discoveries

One new oil field, two new oil-pay discoveries, and one new gas pay strike told the discovery tale in Arkansas during September. The state is enjoying one of its busiest drilling campaigns in several years.

Winchester . . . Olin Oil & Gas Corp. opened Meakin sand production at F-1 Olin Fee in C NW SE 2-18s-12w, 1¾ miles southeast of New London in Union County. This well pumped 126 bbl. of 22°-gravity oil per day from perforations at 2,639-45 ft., opening Winchester field.

This new field is 1 mile northwest of New London field, a Cotton Valley producer.

Rodessa strike . . . A Rodessa oil well was completed in North Stamps field, Lafayette County, by McAlester Fuel Co. The A-1 Maude Petrey, NW NE SW 4-16s-23w, flowed 67 bbl. of 34°-gravity oil per day on 11/64-in. choke. The well flowed oil from the Rodessa and 100 M.c.f. of gas per day from the Mooringsport. A south offset is now drilling.

West Bradley . . . The first Gloyd zone of Rodessa oil production was established at Arkla Oil Co. 3 Hortense Stevens, C E½ SW NW 5-20s-26w, West Bradley field, southeastern Miller County.

The regular pay in this field is the Mitchell sand.

Graves gas well . . . Hargrove Oil & Gas Co. completed a Graves sand gas well on the east side of Union County's Lawson field. The 1 Calvert, C W½ SW NE 5-18s-13w, ⅝ mile east of nearest produtcion, flowed 1,200 M.c.f. of gas per day at 2,652-54 ft.

EASTERN INTERIOR

ILLINOIS

One new oil pool, Sicily in Christian County, was discovered in Illinois in September.

Sicily pool is in the area between Mount Auburn and Springfield, the scene of intensive drilling 2 years ago. Two producing wells have been completed in the Sicily pool.

Ten extensions to pools and three new pays in pools were reported in September. The extensions included two each to Fishhook Gas in Pike County and Harco in Saline County, and one each to Sorento in Bond County, Hord in Clay County, Akin in Franklin County, Dale Consolidated in Hamilton County, Ab Lake West in Gallatin County and New Harmony Consolidated in Wabash County. New pays were the Aux Vases sandstone in Woburn Consolidated pool in Bond County, the Waltersburg sandstone in Ab Lake West pool in Gallatin County and the Hardinsburg sandstone in Harco pool in Saline County.

Cooks Mills Consolidated-Bourbon area in Coles and Douglas counties remains the most active area of drilling in the state. In September, 25 oil wells were completed in Cooks Mills Consolidated pool, four in Bourbon pool, and one in Chesterville pool.

Germantown East pool, discovered in July, appears to be the most important discovery for 1956. In September, 13 oil wells were completed, making a total of 18 producing wells at the end of the month. Most of the wells, producing from a Silurian reef, have initial productions well over 200 bbl., with several in the 400 to 600-bbl. range.

In September (a 5-week period), 394 wells were completed, an average of 79 per week, the same as for August. Drilling for the first 9 months of 1956 is slightly greater than that for the first 9 months of 1955. Of the 394 wells completed, 171 were oil wells and 6 were gas wells in Fishhook Gas pool in Pike and Adams counties.

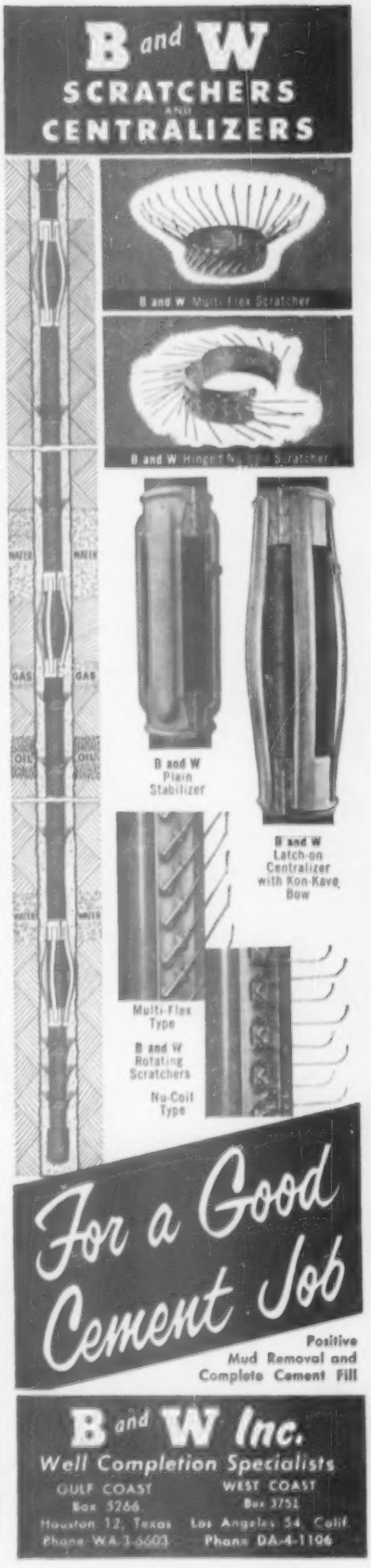
Estimated oil production for September was 7,065,000 bbl., a daily average of 235,000 bbl.

APPALACHIAN

OHIO

Three important extensions that will call for additional drilling were reported during the week. The Wiser Oil 1 Erma Kanuckle, Lot 3, Bethlehem Township, Coshocton County, a mile south of nearest production, logged Clinton sand at 3,508-69 ft. with a small showing natural and 35 bbl. in a 24-hour test after fracture.

In Hopewell Township, Perry County, the Ohio Fuel moved ½ mile northeast of the 1 Moyes to the 2 C. H. Swinehard, Section 4 and found 400,000 cu. ft. natural and 1,350,000 cu. ft. after fracture from Clinton at 2,708-31 ft. The same operator found a pool opener on 1 J. A. Shaver, Section 12, Clay Township, Muskingum



County. Clinton sand at 3,870-3,913 ft. gaged 800,000 cu. ft. natural and 2,960,000 cu. ft. after fracture.

PENNSYLVANIA

In Brush Valley Township, Indiana County, Southwest Pennsylvania, Columbian Carbon Co. 1836 I. R. Smith, wildcat completed at 1,540,000 cu. ft., gas after fracture and had a rock pressure of 4,250 psi. in 48 hours, chert 7,616 ft., gas, Oriskany sand 7,708-46 ft., TD 7,754 ft.

● Gaskill Township, Jefferson County, this company's 1835 Frank M. Sheesley, gaged 3,860,000 cu. ft., gas after fracture, rock pressure 3,800 psi., Onondaga 7,426 ft., chert 7,442 ft., Oriskany sand 7,551 ft. TD 7,551 ft.

WEST VIRGINIA

In Morgan district, Monongalia County, West Virginia, Plymouth Oil Co. et al., have started drilling 1 Myrtle A. Pixler, wildcat, elevation 1,434 ft., Morgantown Quadrangle, .09 mile south of latitude 39 degrees 35 minutes and 1.65 miles west of longitude 79 degrees 50 minutes. This well is approximately .35 miles northwest of Hope Natural Gas Co. 9745 Rosa B. Wolfe, completed dry in December 1953 with a show of gas in the chert at 7,348 ft., finishing at 8,508 ft.

● Sherman district, Hampshire County, Transcontinental Production Co. 1-4 S. T. Haines, elevation 1,342 ft., topped the Oriskany at 5,860 ft., and shut down at 5,920 ft., for testing.

EASTERN KENTUCKY

United Fuel Gas Co. have completed their wildcat 8466 George W. Litz as a good gas well. Located at the mouth of Camp Creek of Knox Creek in Pike County, test topped Mississippian Big lime at 2,200 ft. and was drilled to a total depth of 2,572 ft. Main gas pay occurred from 2,561 to 5,569 ft. and gaged 3,500,000 cu. ft. of gas daily. After acidization with 3,000 gal., well tested at the rate of 6,698,000 cu. ft. per day. A 48 hour rock pressure test showed 850 psi.

GREAT LAKES

MICHIGAN

The Taggart Co. appeared to be assured of its third Salina gas producer in the Overisel field, Allegan County.

While well No. 3, the 1 Hoffman-Klaffen, C SE 16-4n-14w, was not at total depth, a puff of gas was encountered in the Salina, at about 2,634 ft., which fired, injured one driller (not seriously), burned cat line, but did not seriously damage drilling motors. Drilling was scheduled to be back in progress as soon as new line was installed. Exactly how gas happened to blow out was not determined.

Dundee well in the Akron field, Tuscola County, flowed 384 bbl. of net oil in 22 hours on initial test after pay was perforated and acidized with 1,000 gal. This well, the Byron A. Bartlett 1 Elek, NE SE SW 23-14n-7e, Wisner Township, appears to be one of the top Dundee producers drilled to date in the pool. Well was bottomed out dry in Richfield at 3,450 ft., but other pays above the Richfield and below

Exploration this week

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the Dundee, sweet oil Detroit River pays, have been perforated and will be dually completed with the Dundee. This Dundee zone was perforated at points between 2,831-36 ft.

EASTERN CANADA

An Imperial Oil subsidiary, Lowlands Exploration Co., will drill a wildcat well in the St. Gregoire area on the south shore of the St. Lawrence River across from Three Rivers.

W. A. Roliff, who directs Imperial's eastern Canada exploration work, said the wildcat, to be known as Imperial 2 Lowlands, will be the second the company has drilled on the acreage it holds in the area. The first, begun near Leclercville in the spring, is to be abandoned.

Of the Leclercville well, Roliff said: "We have reached formations which are very unlikely to contain oil. Valuable information has been obtained from the rock formations penetrated by the well which was drilled to a depth of more than 3,300 ft."

The present drilling program is the result of 3 years of exploration in the area, including gravity meter and seismic research. Such preparation, Roliff said, is necessary before a company can undertake the costly and often unsuccessful operation of drilling.

WESTERN CANADA

ALBERTA

Cree Hits at First Two Tries

Cree Oil of Canada, Ltd., a recent entrant into the search for and development of oil and gas in western Canada has indicated commercial success at its initial two ventures drilled within the borders of Alberta. One of the indicated producers lies in the Warburg area, 19 miles east of the present proved limits of the Pembina oil field while the other test lies in the same general area, near Breton townsite, 3½ miles west and slightly north of the firm's Warburg strike.

The Creek-Scurry Rainbow-C. M. 7-10A Warburg well, lies on LSD 7, 10-48-3w5 on farmout lands acquired under an agreement from Century Oils, Ltd., and Monarch Oils, Ltd. The Cardium sand was contacted around the 4,150-ft. level and a 20-ft. interval perforated for production test. Initial production test showed the well producing 30 bbl. of clean oil in 7 hours through a 10/64-in. choke, while the second day production was 20 bbl. in 6 hours through an 11/64-in. choke.

At the other hole, Cree-Scurry Rainbow-Texaco 13-12 Breton, on LSD 13, 12-48-4w5, a 23-ft. interval was per-

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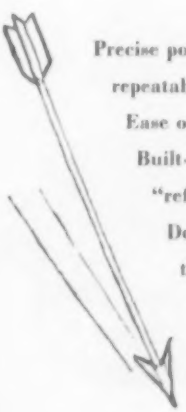

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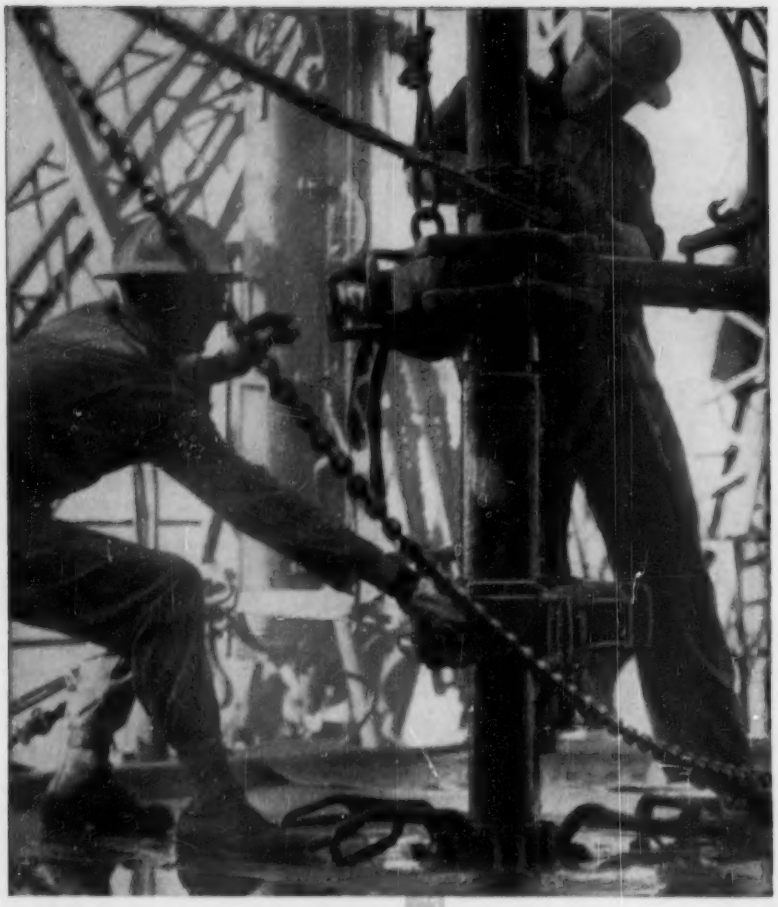

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forated below the Cardium sand contact of 4,263 ft. and the well is currently producing between 5 and 8 bbl. of oil daily from that zone. This test is on acreage farmed out to the firm by Texaco Exploration, Ltd. In both cases, Scurry Rainbow Oils, Ltd., sharing costs of drilling and completing the wells to earn an unspecified interest.

ROCKY MOUNTAIN

NORTHWEST NEW MEXICO

Apparent Gallup Well Flows Oil on Test

Anderson-Prichard Oil Corp. 1 Es-Ka-Yazzie, C NW SW 28-25n-11w, San Juan County, flowed 104 bbl. of oil in 8 hours on test of perforations at 4,987-95 ft. The pay zone is not definitely established, but apparently it is the Gallup sand, pay sand at Bisti. Location of the discovery is 2 miles southeast of Carson, the southeast anchor of Bisti field production. Success at the 1 Es-Ka-Yazzie would bring the Bisti producing trend to more than 15 miles in length, northwest-southeast.

COLORADO

Completion Near at Divide Creek Prospect

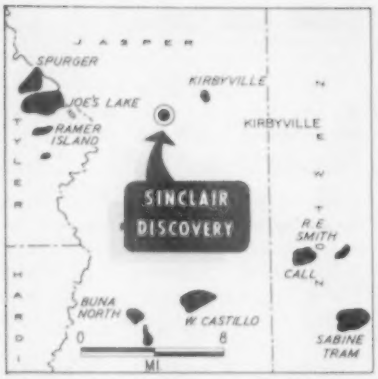
Gordon Hurd will complete and shut in his 1 Government in the Divide Creek area of Mesa County, an isolated mountain area of 9,000 ft. elevation. The well flowed gas at the rate of 6,160 M.c.f. per day on test at 4,126-40 ft.; flowed 4,260 M.c.f. per day at 3,874-3,933 ft. Location is in SW SW NW 36-8s-91w. The coming winter has curbed any further drilling.

UTAH

Uinta Basin Gets Back Into News

The Uinta basin of northeastern Utah is back on the exploratory trail as a result of Havenstrite Oil Co.'s success at 72-22 Federal in SW NE NE 22-9s-20e, 17 miles west of Chapita Wells and 10 miles south of Brennan Bottom. The Green River sand discovery flowed oil at the rate of 45 bbl. per hour on ½-in. choke from perforations at 3,560-80 ft.

The operator is drilling another well in the Ute Trail area at 52-X-22B, SW NW NE 22-9s-20e.



ARROW POINTS to location of Sinclair-Atlantic Yegua oil-discovery well in Jasper County.

SOUTH TEXAS

TEXAS GULF COAST

Jasper County Wildcat Opens Yegua Production

Opening of a Yegua-sand oil field, located 4½ miles west of Kirbyville, in Jasper County, is reported by Sinclair Oil & Gas Co., the operator.

Discovery well, 1 H&TC fee Section 8, in which Atlantic Refining Co. owns 50 per cent interest, produced at the rate of 140 bbl. of 41.6°-gravity oil per day through 5/32-in. choke. Flow was with gas-oil ratio of 486 cu. ft. per barrel. Pressure was 750 psi. on the tubing and 1,350 psi. on the casing.

Its Yegua pay is perforated at 5,897-99 ft. Hole, drilled to 7,100 ft., is plugged back to 5,898 ft. in casing run to 6,030 ft.

Location is 3 miles southwest of a lone Yegua oil producer (Kirbyville field) completed in September 1955 by W. C. Dunlap with pay at 6,286-88 ft.

Nearest other production is at Joe's Lake, 6 miles west, in Tyler County, where pay is in Wilcox sand. Nearest other Yegua production is at Spurger, 7½ miles northwest, also in Tyler County.

PACIFIC COAST

CALIFORNIA

Richfield Joins Search Along Oakridge Uplift

Richfield Oil Corp. has staked location for a Pliocene test 750 ft. northwest of Bardsdale field's regular Miocene producing area, and about 1,500 ft. northeast of Union Oil Co.'s recent Pliocene discovery there. Thus Richfield joins the ranks with Union, The Texas Co. Shell Oil Co. and Universal-Consolidated Oil Co. in this booming play where eight rigs are now drilling.

Union was the last to successfully find new Pliocene pool production by drilling under the Oakridge Fault. They completed 1 Berylwood for 450 bbl. daily as a new pool discovery late last month.

Union Drilling First Strand Offset

Union Oil Co. was drilling ahead below 542 ft. on the first offset to its Stevens pool discovery made last May about 1 mile northwest of regular Strand field production in Kern County. This new test, 53-2 Smith, is two locations west of the discovery.

SOUTH LOUISIANA

Oil Production Indicated In St. Martin Discovery

Pan American Production Co. and Flaitz & Flaitz are completing a lower Oligocene oil-discovery well in northern St. Martin Parish.

It is their 1 Broussard, in 62-8s-6e, 2½ miles southwest of Plumb Bob field, and about 11 miles northeast of Lafayette, in Lafayette Parish.

LOCATION of Pan American Production Co.'s oil-discovery well (indicated by arrow) in northern St. Martin Parish.

Testing perforated interval at 12,006-22 ft., the well flowed at an estimated rate of more than 10 bbl. of 40.1°-gravity oil per hour through 3/16-in. choke. Flow was under pressure of 600 psi. with gas-oil ratio of 800 cu. ft. per barrel.

Hole had been drilled to 14,678 ft.

Location is on a 600-acre block, owned 85 per cent by Pan American, and 15 per cent by Flaitz & Flaitz.

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Furnished in Models A-2, A-4, and B-2, for either 6 or 12 volts.

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MODEL	Volts	Height Cover Closed	Diam. Front to Back	Diam. Side to Side	Net Weight	Shipping Weight	Packing Case (Inches)
A-2 Simplex	6 or 12	14"	17"	17"	52 lbs.	64 lbs.	20x20x17
A-4 Simplex	6 or 12	14"	17"	17"	55 lbs.	67 lbs.	20x20x17
B-2 Simplex	6 or 12	14"	18¼"	18¾"	54 lbs.	66 lbs.	20x20x17

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Ray Clour writes: "We are glad to explain why we use Wichtex Units. These units are easier to rig up and tear down, they are easier to keep clean, they have an abundance of power, they are an understandable unit, and, above all, they are economical to operate. This unit has averaged 76 hours per week since it was purchased in February of this year. We have had no repair expense, and the cost of fuel has averaged $1.18 per day; we are using butane. When we need another unit, it will be a Wichtex."

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BASIN AND RANGE

NEVADA

Two Las Vegas Tests Drilling Ahead

Joe E. Brown, owner of the famed Horseshoe Club in Las Vegas, was setting 11¾ in. surface casing to 1,200 ft. in his wildcat, 1 Wilson-Federal, located 5 miles south of Las Vegas. This wildcat has a projected total depth of 9,000 ft.

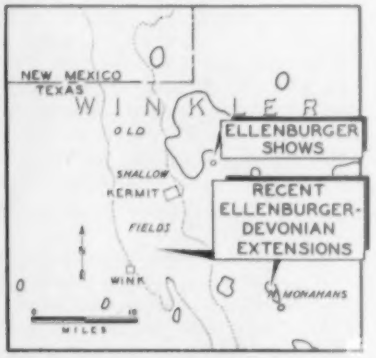
Seven miles southwest of Brown's well, U. S. Oil Co. was drilling ahead below 2,026 ft. on a wildcat test in the Arden Dome region of Clark County.

WEST TEXAS

Winkler County Wildcat Flows Ellenburger Oil

Superior Oil Co. 1-A J. B. Walton, 21-B3-PSL Survey, 3 miles northeast of Kermit in Winkler County, flowed oil on a drill-stem test of the Ellenburger at 10,645-55 ft.

On the above test, gas surfaced in 6 minutes and oil in 66. After cleaning



Map shows location of Superior Oil Co. 1-A Walton, northeast of Kermit, which flowed oil from the Ellenburger. Arrows point to a new area developed by Stanolind and others, northeast of Wink and at North Monahans.

into pits for 10 minutes, it gaged slightly over 26 bbl. of 42.7° oil in 1 hour. Flowing pressure reached 2,000 psi. and 30-minute shut-in pressure was 3,680 psi.

Top of the Ellenburger was 10,583 ft., or minus 7,663 ft. Another test was under way between 10,655-65 ft.

This multipay prospect has also indicated production from the Glorieta and Wichita Albany (Permian sections); flowed gas and distillate from the Devonian, and showed oil, distillate and gas on tests of the McKee (Simpson) sand.

Successful Wildcats

ALBERTA

Dome Naco-Supertest 11-10 Jasper Place, LSD 11, 10-53-25w4. Basal Cretaceous gas well. TD 3,946 ft.

British-American 6-21 Rahab, LSD 6, 27-78-1w6. Notikewin gas well. TD 4,750 ft.

SASKATCHEWAN

Imperial 3-25 Poplar, LSD 3, 25-2-1w2. Mississippian oil well. TD 4,282 ft.

9-5 Goldridge, LSD 9, 5-4-2w2. Mississippian oil well. TD 4,500 ft.

SOUTHWEST TEXAS

Dimmit County: Pronto Drilling Co. 1 T. H. Brady estate, I&GN Sur., A-485. IP 83 BOPD, 5/32-in., GOR 400 cu. ft. per barrel, perfs. 2,393-96 ft. and 2,406-12 ft. TD 3,008 ft. (New field.)

Duval County: Benedum-Trees Oil Co. 2 Leroy Denman estate, Santos Garcia Grant, A-1985. IP 14,500 M.c.f. daily, open-flow potential, perfs. 3,981-87 ft. (Jackson). TD 5,600 ft. (New field.)

Jim Wells County: Tidewater Oil Co. 1 Shaeffer ranch, Thomas Garcia Sur. 8, A-167. Shut-in gas well, no gage, perfs. 4,980½-86½ ft. TD 5,900 ft. (New field.)

Starr County: Sid Katz 1 Ricaby estate, Porcion 83. IP 48.97 BOPD, ¼-in., 26°, perfs. 1,985-90 ft. TD 2,605 ft. (New field.)

WEST TEXAS

Andrews County: The Texas Co. 1 State "BR," 23-6-ULS, 17 miles NE Andrews. IP 823 BOPD, 22/64-in., TP 1,800 psi., GOR 1265, 42.7°, Mississippian perforations 12,054-14 ft., TD 12,680 ft., elev. 3,015 ft., top Mississippian 12,057 ft. Suggested new field name, Block 6 (Miss.)

Dawson County: Seaboard Oil Co. 1-A Weaver, Lab. 27, Lge. 3, Taylor CSL, 7 miles NW Lamesa. IP 246 BOPD, 14/64-in., TP 450 psi., GOR 238, 36°, Pennsylvanian reef pay top 8,973 ft. TD 9,147 ft., elev. 3,030 ft.

Gaines County: Cities Service Production Co. 9 Proctor, 355-G,CCSD&RGNG, new pay in West Seminole field. IP 355 BOPD, 1-in., TP 25 psi., GOR zero, 38°, Devonian pay 11,136 ft., TD 12,585 ft., PB 11,211 ft., elev. 3,465 ft.

Irion County: Phillips Petroleum Co. 1-A Nutt, 41-A-463, L&SV Sur., 4 miles NW Mertzon. IPP 108 BOPD, 37°, GOR 208, Wichita Albany 3,412 ft. TD 6,390 ft.

Upton County: Magnolia Petroleum Co. 2 Windham, 104-D-CCSD&RGNG, new pay in Amacker-Tippett (Penn.) field. IP 414 BOPD, 18/64-in., Pennsylvanian pay 9,651-9,712 ft. IP 321 BOPD, 16/64-in., TP 1,400 psi., GOR 1,822, 42°, Fusselman perforations (new pay) 11,474-11,526 ft. TD 12,364 ft.

NORTH TEXAS

Archer County: Jack Grace Production Co. 1 Edwards, Blk. 18, L. P. Hunt Subd., G. Bruner Sur., A-8, 1½ miles NW Scotland. IPP 18 BOPD, 44°, pay 5,812 ft. TD 5,864 ft.

Clay County: L. T. Burns 1 Childress, TE&L Sur. 2843, A-546, 1 mile NE Vashti. IP 56.5 BOPD, 12/64-in., TP 140 psi., GOR 633, 44°, Ordovician pay 6,746-58 ft. TD 6,779 ft.

Jack County: Fain & McGaha 3 Sparks, T. D. Sporer Sur., A-2378, 7 miles SE Antelope. IPP 30 BOPD, 40°, GOR 450, pay 2,476 ft. TD 2,477 ft.

Knox County: Lomax & Maxwell 1 Cartwright, 71-45-H&TC, 2½ miles E Goree. IPP 52 BOPD, 34°, GOR 200, Tannehill sand 1,706-10 ft. TD 1,763 ft.

Young County: Grace-Schlittler Operating Co. 1 Norris, H. Mahler Sur., A-1345, 8 miles NE Graham. Previously completed dry at TD 3,710 ft. Re-entered and PB to 3,705 ft., pay 3,518 ft., IPP 79 BOPD, 40°, GOR 520 ft.

Kenneth Rich 1 Graham estate, Sec. 2901, TE&L Sur., A-1170, 5 miles S Proffitt. IP 172 BOPD, 16/64-in., TP 285 psi., GOR 650, 39°, Bryson sand 3,408-24 ft., TD 3,424 ft.

WEST CENTRAL TEXAS

Jones County: Fox & Ransdell 1 Bumpass, A. B. Jones Sur. 265, 3 miles W Truby. IPP 78 BOPD, 43°, GOR 450, Palo Pinto 4,254-62 ft. TD 4,752 ft.

SOUTHEAST NEW MEXICO

Eddy County: U. S. Smelting, Refining & Mining Co. 1 Gentry, 29-22s-27e. IPP 37 BOPD, 34.5°, Delaware pay 5,160 ft. TD 7,300 ft., PB 5,372 ft., elev. 3,162 ft.

EAST TEXAS

Harrison County: Robert Cargill 1 Brown, P. Daugherty Sur., A-5, 12 miles E Marshall, 1½ miles N production in North Scottsville field. IP 2,200 M.c.f. gas, 32/64-in., TP 842 psi., GLR 71,000:1, 65°, lower Pettit 6,181-86 ft. TD 6,368 ft., elev. 290 ft.

TEXAS GULF COAST

Bee County: J. W. Gorman et al., 2 Linke estate, Martin Lawler Sur., A-220. IP 60,000 M.c.f. daily, open-flow potential, dry gas, perfs. 2,657-63 ft. (Heterostegina), and (dual completion) 10,500 M.c.f. daily, open-flow potential, dry gas, perfs 2,358-64 ft. (Heterostegina). TD 3,900 ft. (New field.)

Live Oak County: Coastal States Gas Producing Co. 1 Freeman, common line of I. W. Smith, A-431, and Stephen Simmons, A-422, surveys. IP 63 BOPD, 7/64-in., 42°, perfs. 4,715-20 ft. (Pettus). TD 4,720 ft. (New field—Freeman.)

Nueces County: The Texas Co. 4 Gallagher, J. H. Smith Sur. 25, A-305. IP 121 BOPD, 9/64-in., 24.6°, perfs. 4,195-4,201 ft. TD 4,260 ft. (New pay in Cody field.)

Newton County: Texas Gulf Producing Co. and Rowan Oil Co. 3 Morgan et al., James A. Mason Sur., A-324. IP 175.48 BOPD, ⅛-in., 41.5°, perfs. 2,549-54 ft. TD 7,703 ft. (New pay in Hartburg area.)

San Patricio County: Marine Gathering Co. 1 Anderson, George H. Paul Subd., Fulton Pasture Lands, Sec. 75. IP 3,000 M.c.f. daily, ⅛-in., 60 BC per M.M.c.f., 59.4°, perfs. 9,934-49 ft. (basal Frio) TD 10,510 ft. (Discovery well of Commonwealth field.)

Victoria County: Joseph S. Morris et al., 1 Vaughn, T&NO Sur. 11, A-484. IP 4,700 M.c.f. daily, open-flow potential, GOR 40 M.c.f. per barrel, 61°, perfs. 8,651-59 ft. TD 8,750 ft. (New reservoir ¾ mile SE of Fordtran.)

PENNSYLVANIA

Indiana County, Brush Valley Township: Columbian Carbon Co. 1836 I. R. Smith, 1,540,000 cu. ft., gas after fracture, rock pressure 4,250 psi. in 48 hours, chert 7,616 ft., gas, Oriskany sand 7,708-46 ft. TD 7,754 ft.

Jefferson County, Gaskill Township: Columbian Carbon Co. 1835 Frank M. Sheesley, 3,860,000 cu. ft., gas after fracture, rock pressure 3,800 psi., Onondaga 7,426 ft., chert 7,442 ft., Oriskany sand 7,518 ft. TD 7,551 ft.

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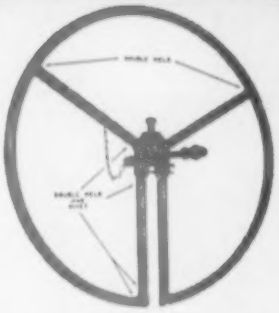

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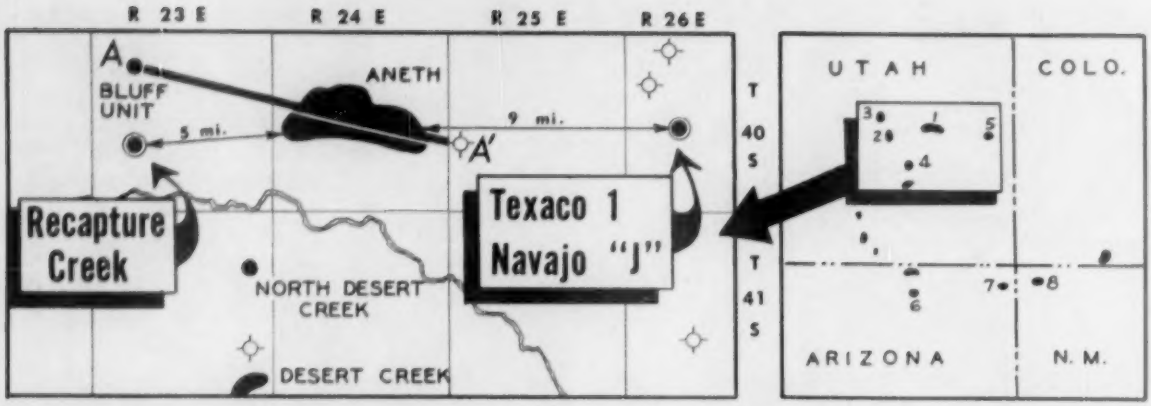

NEW DISCOVERIES have stretched the Aneth trend out to cover nearly 20 miles. The 1956 discoveries in the Paradox basin are shown in the index map at right; map numbers are keyed to the wells listed in Table 1. Fig. 1.

Utah has Rockies' hottest area as . . .

Aneth Trend Expands Rapidly

by Norman S. Morrisey
Drilling Development Editor

ANETH, the most significant strike in the Rocky Mountains since the discovery of Madison oil in the Williston basin. Aneth, an oil field that is already 5 miles long with only 12 development wells drilled to date. And the producing area may extend another 6 miles if subsequent drilling joins Aneth with Shell Oil Co. 1-C Bluff unit, lying 6 miles northwest.

New discoveries are rapidly making the Aneth area the fastest growing trend in the country today (see index map, Fig. 1). Shell Oil Co. is currently completing its 1 Recapture Creek, new Hermosa (Pennsylvanian) discovery 5 miles west of Aneth. The Texas Co. has a wildcat discovery 9 miles due east of Aneth at the 1-J Navajo.

Paradox oil at Aneth has given the Paradox basin a much-needed key oil strike. It's not the first Paradox oil for the basin. But few people will argue against its importance. The discovery well, The Texas Co. 1 Navajo (23-40s-24e) flowed oil at the rate of 55 bbl. per hour on completion test early in 1956. Since then 12 wells have been successfully completed with only one dry hole. The duster, Texaco 1-F Navajo, was an east stepout located in 19-40s-25e (see cross-section, Fig. 2). The dry hole is 50 to 70 ft. lower than the nearest producer in the field on the top of the Paradox pay zone.

Wells on the west edge of Aneth apparently are completed in a different zone than the discovery since Texaco classified its 2-G Navajo (SE SE 18-40s-24e) as a new pool discovery.

Paradox pay . . . The principal producing zone at Aneth is a porous zone that occurs in the Paradox member of the Hermosa formation (see cross-section). Core data and electric log analysis indicate that the producing zone is fairly continuous throughout the field and is a porous limestone or dolomite. This zone is 40 ft. thick if well developed and occurs 70-100 ft. below the top of the Paradox (see cross-section). There is some evidence to show that the interval between the top of the Paradox and the top of the main pay zone thins. This thinning can be explained in two ways to account for production, first by reefing and second by structural growth during deposition.

Reefs are known and have been described in the Paradox in San Juan County. Wengerd[1] and others have mapped these reefs along the San Juan River in the south-central part of the county. These reefs occur at definite stratigraphic levels in the Paradox member and these reef trends can be traced

TABLE 1—1956 DISCOVERIES IN THE PARADOX BASIN

Field and discovery well—	Location	D.s.t. or i.p. on discovery (b.o.p.d.)	Pay zone	Map No.	Completion data
UTAH:					
Aneth—Texaco 1 Navajo	23-40s-24e	55	Paradox	1	Mar. 1956
Recapture Creek—Shell 1 Recapture Creek	20-40s-23e	15-30	Hermosa	2	Testing
Bluff Unit—Shell 3 Unit	4-40s-23e	2	Paradox	3	Testing
North Desert Creek—Shell 1 North Desert Creek	12-41s-23e	1,440	Paradox	4	Testing
Texaco 1-J Navajo—Texaco 1-J Navajo	20-40s-26e	Oil on d.s.t.	Paradox	5	Testing
ARIZONA:					
North Toh-Atin—Franco-Western Oil 1 Navajo		*7.45	Paradox	6	Aug. 1956
Bita Peak—El Paso-Stanolind 1 Bita Peak	19-41n-31e	*20.8	Paradox	7	Sept. 1956
NEW MEXICO:					
Four Corners—Humble 1-B Navajo	29-32n-20w	369	Paradox	8	May 1956

*M.M.c.f. gas per day.

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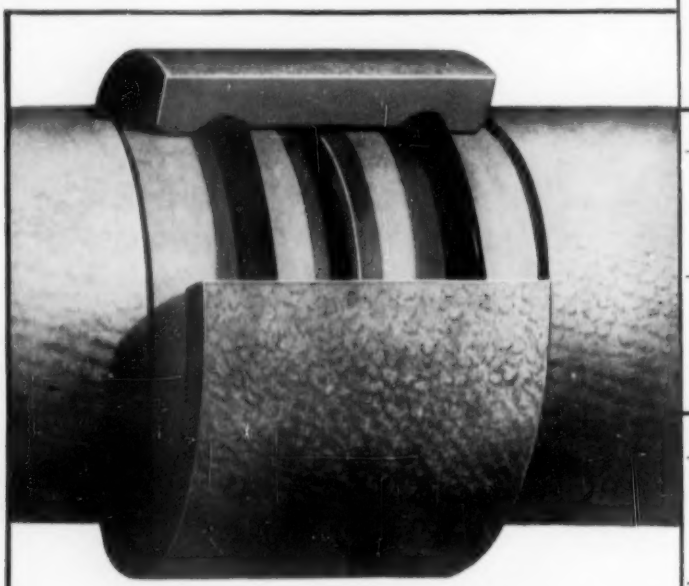
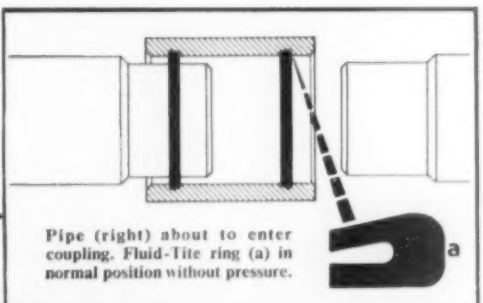
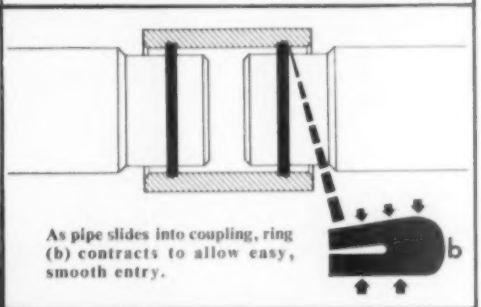


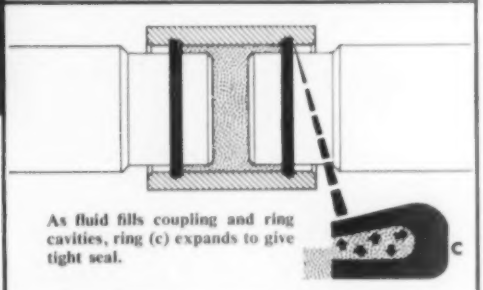
"CENTURY" ASBESTOS-CEMENT "FLUID-TITE" COUPLING (sectioned). Make-up speed results from holes in tapered "Fluid-tite" sealing rings. Holes permit rings to compress, allowing pipe ends to slide into coupling easily and without a special puller.



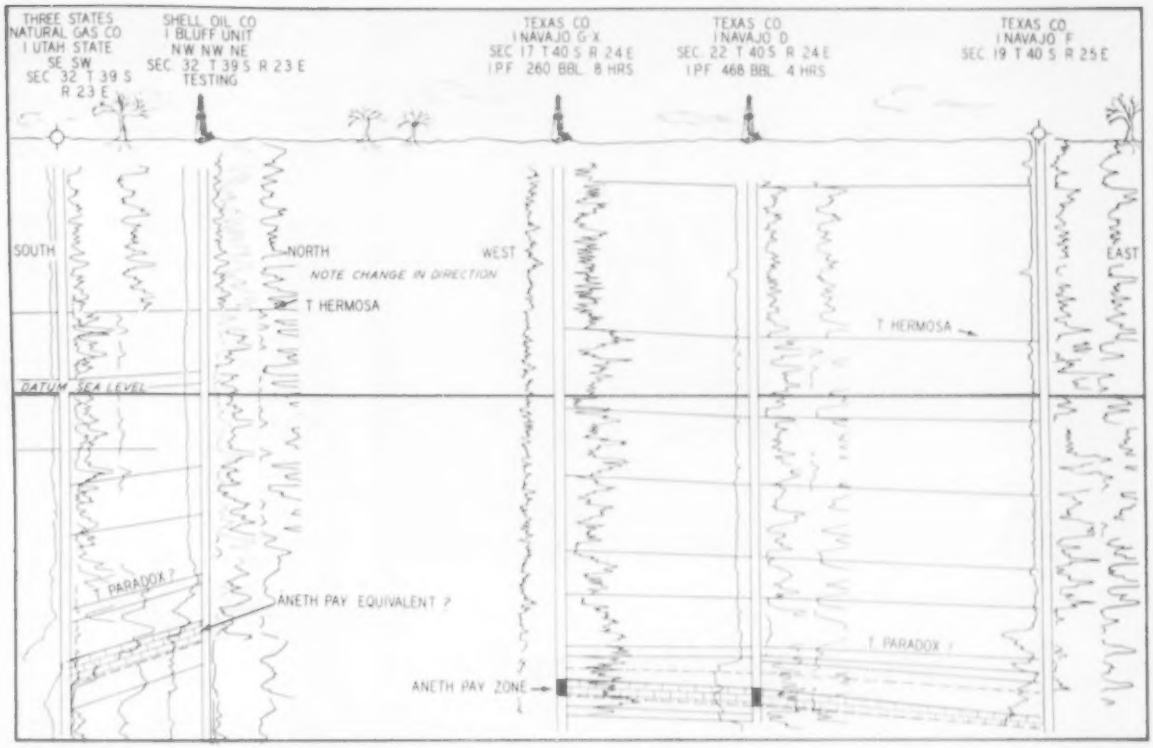
Pipe (right) about to enter coupling. Fluid-Tite ring (a) in normal position without pressure.



As pipe slides into coupling, ring (b) contracts to allow easy, smooth entry.



As fluid fills coupling and ring cavities, ring (c) expands to give tight seal.



NORTHWEST-SOUTHEAST CROSS-SECTION A-A' extends from the Bluff unit across Aneth. The pay zone at **Aneth apparently does not produce at the Bluff unit. Fig. 2.**

for many miles along the outcrops. If Aneth is a reef, subsurface data show that the reef is a low-relief feature.

The Paradox member in the vicinity of Aneth was deposited in a marine environment and this facies has been termed the foreland or platform facies. This depositional environment was particularly suited for the growth of biohermal reefs. To the northeast, the Paradox grades into a black shale facies. This facies was deposited in the deeper parts of the Pennsylvanian depositional basin, but later uplift has completely altered the original picture. The foreland facies within the Paradox now lies along the southwest flank of the Blanding basin, a structural basin that formed after Paradox and Hermosa deposition.

Oil finders at the moment are concentrating their efforts on finding and extending the porous zones within the limestones and dolomites of the foreland or platform facies in the Paradox basin. The 1956 record shows how successful their approach is (see Table 1).

Most Paradox oil is associated with old structures in the Four Corners area. The more obvious surface anticlines were formed too late to trap Paradox oil. Many of these structures are poorly located with respect to the foreland or reef facies of the Paradox. Drilling to date on these young anticlines tends to support this theory in view of the disappointing results on many of these large surface structures.

Reserves . . . Wengerd[2] points out that many tests of the porous zones in the Paradox have yielded salt water and that the driving mechanism in the Paradox oil reservoirs will probably be salt water, possibly with some aid from gas in solution. Normally water-drive reservoirs yield high ultimate oil recoveries. If this line of reasoning holds true at Aneth, the field should be a prolific one. One factor that cuts down the estimated ultimate production is the relatively thin oil column and pay thickness. The zone is only about 40 ft. thick, and it occurs at a drilling depth of only 5,700 ft. A conservative figure of 100 bbl. of oil per acre-foot of pay gives reserves of 160,000 bbl. per 40-acre well site.

References

1. Wengerd, Sherman A., "Biohermal Trends in Pennsylvanian Strata of San Juan County, Utah," appearing in Geology of Parts of Paradox, Black Mesa, and San Juan Basins, Four Corners Field Conference, 1955, published by Four Corners Geological Society.

2. Wengerd, Sherman A., "A Look at Paradox Oil in the Four Corners Region," The Oil and Gas Journal, September 24, 1956, p. 106.

SUCCESSFUL WILDCATS

(Continued from page 169)

NEBRASKA

Kimball County: Sam G. Harrison 1 Kleinholtz, C NW NW 17-14n-56w. IPP 185 BOPD, "J" sand discovery, new field. TD 6,764 ft. Skull Creek.

SOUTH LOUISIANA

Lafayette Parish: Sunray Mid-Continent Oil Co. and Buffalo Oil Co. 1 Bruner, 17-10s-3e. IP 2,000 M.c.f. daily with 1 BOPD, 7/8-in., 39°, perfs. 13,320-29 ft. TD 15,210 ft. (Extension and new reservoir, Duson-Ridge area.)

Acadia Parish: Columbian Carbon Co. 1 Desormeaux, 61-10s-2w. IP 31 BCPD and 700 M.c.f. daily, 5/32-in., 63°, perfs. 9,739-45 ft. TD 15,561 ft. (New field.)

Lafourche Parish: Natural Gas & Oil Co. 1 L.I.&E., 39-19s-22e. IP 146 BOPD and 165 M.c.f. daily, 7/64-in., 39.3°, perfs. 11,161-64½ ft. TD 12,323 ft. (New field.)

Plaquemines Parish: Continental Oil Co. 2 State Lease 987, Blk. 82, West Delta area, Gulf of Mexico. IP 266 BOPD and 128 M.c.f. daily, 9/64-in., 30.6°, perfs. 10,152-66 ft. TD 11,029 ft. (Extends South Pass Block 41 field.)

Pointe Coupee Parish: Sunnyland Contracting Co. 1 McCouslind-Olinde Unit, 35-5s-9e. IP 123 BOPD, 1/8-in., 44°, perfs. 10,432-37 ft. (Sparta). TD 10,550 ft. (New pay in Frisco field.)

Vermilion Parish: Seaboard Oil Co. 1 Baudoin, 38-11s-3e. IP 115 BCPD and 2,300 M.c.f. daily, 5/8-in., 55°, perfs. 9,490-95 ft. TD 11,447 ft. (Confirmation well and new-pay discovery in Maurice field.)

Texas Gas gets a face lifting . . .

. . . Riggins' Know-How at Work

ONE of the hottest gas salesmen in Texas is a veteran oil financial expert. He entered the gas business from the top—but with plenty of ideas and management know-how picked up from years in the oil game.

Russell M. Riggins took over as president and director of Texas Gas Corp. only 5 years ago. At the time the company couldn't fulfill its gas-sales contracts. It was tottering financially.

Since then the tireless Riggins has seen Texas Gas:

. . . **Increase by four-fold** the amount of gas it handles. The volume was 285,000 M.c.f. daily in mid-1956.

. . . **Modernize two gas-processing plants** to increase efficiency and produce high-octane gasoline.

. . . **Form a new subsidiary,** Texas Gas Pipe Line Corp., to deliver gas interstate to Transcontinental Gas Pipe Line Corp. in Louisiana.

. . . **Refinance old bonds** totaling $19 million of which $15 million had been in default.

. . . **Finance much new expansion** out of earnings.

Likes a challenge . . . The revitalized Texas Gas reveals much about the character and operating methods of the man at its helm.

Riggins is an intense individual who thrives on a challenge and seeing a hard job through to the finish. In the case of Texas Gas, the name is only 5 years old. It was formed to take over assets of McCarthy Chemical Co., and Riggins was asked to assume executive management.

The properties included an idle chemical plant and two processing plants at Winnie, Southeast Texas. Last year the New Ulm Corp., a producing firm with holdings in the Texas oil field of the same name, was acquired as a subsidiary and absorbed into the parent corporation.

Besides setting the company house in order, Riggins directed a novel approach to one of the gas industry's big problems—federal regulation of gas producers. Texas Gas has set up a separate system to handle the interstate commitments. Another entity controls the intrastate lines. Thus, the company is in position to satisfy the producer's wishes no matter where he wants his gas marketed.

Riggins also has directed Texas Gas' point of view into the future. He figures the company has a long suit in gas, and he means to make the most of it. This year the company instituted a research program to develop new petrochemicals and particularly feed stocks for the expanding industry from gas processed at Winnie.

Riggins is going one step farther. He has embarked on a promotional campaign to interest new industry in locating in Southeast Texas. He figures the more industries, the more gas his firm will sell.

Praises his staff . . . While Riggins has maintained a firm hand at the helm of Texas Gas, he's the first to disclaim all the credit and praise his staff for much of the success.

He says his policy is to set up a staff of highly qualified administrators who can develop excellent assistants. The company's success then becomes a joint effort.

Riggins is a native Texan—born in Gainesville in 1894. But his family moved north into Indian Territory. He attended public schools in Asher, Okla. His first job was as a railroad clerk at the age of 15 and he spent his early years railroading.

Riggins served as a lieutenant of infantry in World War I. He maintained his reserve status in the postwar years and was recalled to active duty in World War II. He served as a colonel in ordnance, finally retiring from the reserve in 1955 with the Legion of Merit award.

Riggins did a short stint as a private accountant after the first war and then broke into the oil industry as secretary-treasurer and director of Independent Oil & Gas Co. and its subsidiaries, Independent Pipe Line Co., Independent Natural Gas Co., and Manhattan Oil Co. These firms consolidated with Phillips Petroleum Co. in 1930.

Riggins served as controller and member of the Phillips operating committee until 1938. Then he became treasurer of the company as well as of Phillips Pipe Line Co., Standish Pipe Line Co., and Western Radio Telegraph Co. In 1944, he also served as vice president of Phillips Venezuelan Co. and Phillips Colombian Co.

J. D. Hall has been appointed general foreman in charge of the new solvents department in the process division of Humble Oil & Refining Co.'s Baytown, Tex., refinery.

S. N. Davidson, petroleum engineer for the Harbor Department of Long Beach, Calif., has resigned to join Northrop Aviation in Hawthorne, Calif., as executive advisor to the vice president.

R. F. Naul has been appointed superintendent of gas and gasoline plants in the West Texas division of The Texas Co., Fort Worth. Naul was formerly assistant superintendent. He succeeds the late A. E. Willig.

Willard A. Sanger, district geologist for Pure Oil Co. in Mount Pleasant, Mich., has been transferred to Houston. **Joseph Schwietering,** also geologist for the company in Mount Pleasant, has been transferred to Casper, Wyo.

Personals

Harry Tuoei, geologist with Henson Drilling Co. in Carmi, Ill., has been transferred to Tulsa.

Phelan H. Hunter, president of Interstate Oil Pipe Line Co., has been elected a director of the Transportation Association of America.

Thomas J. Nichols, junior engineer with Sohio Petroleum Co., has been transferred from the company's Kansas district to the Oklahoma district, Oklahoma City.

T. M. Newsom has been promoted to senior chemical engineer and **C. L. Thorpe** to senior research chemist in the technical and research divisions of Humble Oil & Refining Co.'s Baytown, Tex., refinery.

Ron Stever, president of Ron Stever & Co., consulting firm of Los Angeles, has been elected a director of Nortex Oil & Gas Corp., replacing **Arnold H. Bruner**, who has resigned. **William M. Parks,** vice president and general counsel of the company and **Wilford B. Kirk,** vice president, Texas Bank & Trust Co., have also been elected directors of Nortex.

John P. Hammond, chief petroleum engineer for Amerada Petroleum Corp. in Tulsa, was elected chairman of the petroleum branch of American Institute of Mining and Metallurgical Engineers at the group's annual meeting last week.

James L. Martin, Jr., assistant chief geologist for Sinclair Oil & Gas Co., has been appointed chief geologist. Martin joined Sinclair in 1943. He was previously with the Louisiana Geological Survey. A graduate of Princeton University, Martin also holds M.S. and Ph.D. degrees from Louisiana State University. He was appointed assistant chief geologist for Sinclair in 1955.

C. L. Suhr, Oil City, Pa., chairman of the board of South Penn Oil Co., was honored as "Oil Man of the Year," at the recent Western Pennsylvania Oil Progress Week dinner in Pittsburgh. Suhr was associated for many years with the Pennzoil Co., now the refining division of South Penn. He has been connected with all phases of the industry — production, refining, pipelining, marketing, and management. **C. J. Guzzo,** vice president of Gulf Oil Corp., presented the award.

Q. C. Walton, tool pusher with Kerr-McGee Oil Industries, Inc., has been transferred from Cody, Wyo., to Worland, Wyo.

J. W. Lane, manager of the automotive division of Socony Mobil Oil Co.'s lubricating department in New York, has been elected president of the National Lubricating Grease Institute.

John Hill, district geophysicist at Wichita, Kans., for Carter Oil Co., has been named assistant division geophysicist at Oklahoma City. **Ralph Brewer,** formerly with Central Exploration Co., will replace Hill in Wichita.

George B. Hamilton, chemical engineer with The Texas Co.'s technical service department in Beacon, N. Y., has been transferred to Santiago de Cuba, Cuba, as technical supervisor of the company's refinery there.

Sidney W. Coan has been named production engineer in the Lafayette, La., office of Atlantic Refining Co. **C. A. Kinney** has been appointed regional superintendent for the company in Lafayette.

John Taylor has been promoted to group head in the process engineering section, planning engineering, for Esso Research & Engineering Co. in Linden, N. J. **Ray Beresford** and **Don Hedeen** have been named group heads in the company's refinery economics section. New group heads in design engineering are **John Beesley, Jerry Canevari, Tom Leahey, Dick Kilpert** and **Bob Thomas.**

Fred W. Batten, vice president and general manager of the Pittsburgh natural gas companies of the Columbia Gas System, has been elected vice president of Columbia Gas System Service Corp. He will be transferred from Pittsburgh to New York in this capacity. Batten joined Columbia in 1936. He has held his position in Pittsburgh since 1951.

Dr. George E. Holbrook, assistant general manager of the organic chemicals department for E. I. du Pont de Nemours & Co., has been named general manager of the company's new elastomer chemicals department. **Ernest R. Bridgewater,** formerly head of sales activities in the elastomer division, has been named assistant general manager in the new department. **Dr. William C. Kay,** director of manufacturing of the organic chemicals department, will succeed Dr. Holbrook as assistant general manager, organic chemicals department.

Reaves Lowman, geologist with Delta Oil Co. in Evansville, Ind., has been promoted and transferred to Pittsburgh.

J. M. Linehan, president of Mid-Continent Pipe Line Co., has been named general manager of the crude oil sales and purchase department of Sunray Mid-Continent Oil Co. in addition to his other duties. Linehan joined Mid-Continent, then known as Cosden Pipe Line Co., in 1935. He has served the company as southern division superintendent, general superintendent, and vice president and general manager. He became president in 1947.

Ross McCollum has been elected president of Basin Oil Co. He succeeds **Thomas C. Beament,** who has resigned. **J. W. Schmid** has been named vice president of the company and **Victor M. Carter** will serve as a director.

Thomas O. Davis, Jr., has been transferred from the Dallas office of Atlantic Refining Co. to Casper, Wyo., as regional petroleum engineer. In the Dallas office, **John E. Garrett, Jr.,** has been promoted to senior reservoir engineer, and **William J. Dean** to associate research engineer.

Thomas Moore, production research coordinator for Esso Research & Engineering Co., has been appointed research contact and secretary of the production research committee for Standard Oil Co. (N.J.). **Bruce Blount,** technical assistant in Esso's production research department, has been transferred to Carter Oil Co. in a similar capacity. The changes resulted when Carter Oil assumed the functions of Esso's production research department.

J. O. Allred, B. A. Martin, and **W. N. Lyster** have rejoined Humble Oil & Refining Co.'s Baytown, Tex., refinery after military service. All three are in the refinery's technical service division. Other staff additions at the Baytown refinery include **H. C. Edwards, L. P. Karvelas, J. M. Montgomery, H. B. Payne,** all in the technical service division. In the research and development division **E. M. Magee, W. A. Morgan, R. E. Pennington, J. T. Richardson,** and **D. H. Willson** have joined the staff.

Personals

G. W. CLARK

Glenn W. Clark has resigned as president of Cities Service Gas Co., Oklahoma City, to accept the same position with Mississippi River Fuel Corp. of St. Louis. He succeeds **William G. Marbury,** who has been elected chairman of the board. Clark has spent most of his career with the Cities Service companies. He is a member of the board of directors of the parent company and at one time was president of Cities Service Gas Development Co. He will assume his new duties November 15.

Larry W. Spillman has joined Cities Service Oil Co. as junior engineer trainee in the production division, Bartlesville, Okla.

Herbert R. Kane, formerly geologist for Hunt Oil Co. in the Williston basin area, has opened consulting offices in Wolf Point, Mont.

Dr. Oran D. Steffey has joined Continental Oil Co. as a research associate in the company's research laboratories in Ponca City, Okla. Steffey was formerly professor at Oklahoma A&M College.

B. J. Brown, engineer with Intercoast & McRae at Midland, Tex., has been named production engineer for McRae Oil & Gas Corp. He will set up a new district office for the company in Oklahoma City.

F. Cushing Smith has been appointed general manager of supply and transportation department for Standard Oil Co. (Ind.). Smith joined Indiana Standard in 1943 as a chemical engineer. He replaces **Robert C. Gunness,** who has been named executive vice president.

J. E. Vilm, manager of crude-oil purchasing and transportation for National Cooperative Refinery Association, has been appointed manager of the company's crude-oil division. Vilm will have headquarters in Wichita, Kans. **Bert Hoagland** has been named assistant manager of the division and will be in charge of the company's Denver office. **Glen L. Peterson,** McPherson, Kans., will replace Vilm as crude-oil purchasing and transportation manager, and **Lawrence O. Detmer** has been named general superintendent of the company.

L. Millard Gelvin, formerly with Gulf Oil Corp. in Tulsa, has joined Ben F. and Howard J. Whitehill, Tulsa oil producers. Gelvin will be assistant to **Ben F. Whitehill.**

Neal Colby has been named to head the new Oklahoma City office of Garvey Drilling Co., Great Bend, Kans.

Finnis Waltman, production engineer with General American Oil Co. of Texas, has been transferred from Carmichael, Miss., to Citronelle, Ala.

R. W. Crume, district geologist for Skelly Oil Co. in Lafayette, La., has resigned to open consulting offices in Lafayette.

William J. Williams, Jr., has been appointed traffic manager of Peoples Natural Gas Co., New York State Natural Gas Corp., and Hope Natural Gas Co. A graduate of Penn State University, Williams has been with Peoples Natural Gas since 1935.

E. W. Patterson, sales manager of Suntide Refining Co., has been elected a vice president. A graduate of the University of Houston, Patterson has been with Suntide since 1952. He was formerly with D-X Sunray Oil Co. at their Duncan, Okla., refinery.

R. E. White assistant to the regional general manager in Continental Oil Co.'s Rocky Mountain area, has been appointed superintendent of the company's new Colorado-New Mexico production district. **H. D. Roberts,** district production superintendent at Denver, has been named superintendent of the company's Fort Morgan, Colo., office. **G. L. Corbell,** senior production foreman at Fort Morgan, has been appointed superintendent at Craig, Colo.

G. L. McMahon, Pacific Petroleums, Ltd., has been elected to a 1-year term as a director of the Canadian Petroleum Association. Elected to 2-year terms as directors were **E. C. Babson,** Union Oil Co. of California; **A. E. Feldmeyer,** Canadian Superior Oil of California, Ltd.; **J. P. Gallagher,** Dome Exploration (Western) Ltd.; **G. H. Galloway,** Stanolind Oil & Gas Co.; **W. H. Hohag,** Banff Oils, Ltd.; **Dr. W. C. Howells,** McColl - Frontenac Oil Co., Ltd.; **C. A. Nabors,** Parker Drilling Co. of Canada, Ltd.; **N. W. Nichols,** Great Plains Development Co. of Canada, Ltd.; **T. Nitescu,** Canadian Fina Oil, Ltd.; **J. G. Spratt,** Triad Oil Co., Ltd.; **S. Stewart,** Richfield Oil Corp.; and **J. B. Webb,** Canadian Oil Companies, Ltd.

B. I. Graves, petroleum consultant in San Francisco, has been elected a director of the Natomas Corp.

Dwight Redmond, Jr., has been appointed assistant to the division manager in Falcon Seaboard Drilling Co.'s Gulf Coast division.

George V. Rowland, industrial sales manager of Cities Service Gas Producing Co., and **A. W. Levan,** assistant secretary, have been named directors of the company, which is a subsidiary of Cities Service Gas Co.

Richard E. Lauterbach, manager of manufacturing for General Petroleum Corp., and formerly manager of the company's Ferndale, Wash., refinery, has been elected president of the Engineers Club of Los Angeles.

Edward H. Leede has been appointed division manager of West Texas operations for White Eagle Oil Co. Leede has been in charge of the company's producing property acquisition department in Tulsa. He will transfer to Midland, Tex., in his new position. Leede graduated from Dartmouth College with a degree in engineering, and from the Harvard Graduate School of Business.

DEATHS

W. H. Rinehart, technical consultant and manager of Syrian-Arabian Oil Co., died recently in Damascus, Syria. Rinehart worked with Iraq Petroleum Co. for many years and had engaged in drilling activities in the U.S., South America, India, and various areas in the Middle East.

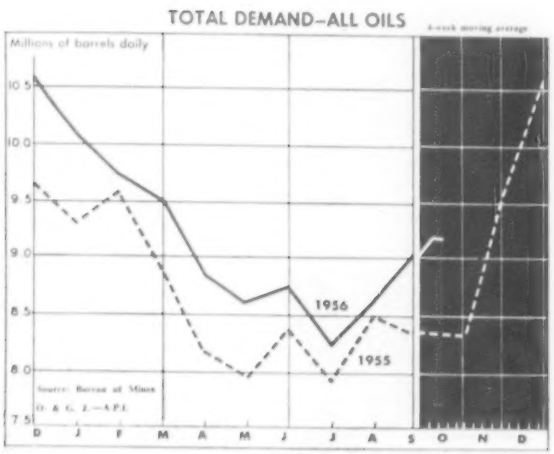
Albert S. McKenzie, 59, assistant vice president of sales for Natural Gas Pipeline Co. of America, Texas Illinois Natural Gas Pipeline Co., and other affiliated companies, died October 14 after a heart attack.

E. B. La Rue, 63, Athens, Tex., independent operator, died October 17 in Athens. La Rue had drilled more than 100 wildcats in East Texas since 1930. He expanded his operations beginning in 1953 and since then had drilled three tests on the Georgia coast and 11 more in Mississippi and Alabama. A brother, Ike La Rue, is a Jacksonville, Miss., independent.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,015,375	UP	8,500	UP	148,495
Crude stocks	279,458,000	UP	2,491,000	UP	24,324,000
Completions	1,113	UP	10	UP	39
Refinery runs	7,530,000	UP	32,000	UP	53,000
Gasoline stocks	173,087,000	DOWN	975,000	UP	21,551,000
Kerosine stocks	33,929,000	UP	365,000	DOWN	2,915,000
Distillate stocks	155,288,000	UP	2,089,000	UP	5,402,000
Residual stocks	47,715,000	UP	366,000	UP	1,074,000
Four-product stocks	410,019,000	UP	1,845,000	UP	25,112,000
Total imports	1,548,400	UP	355,100	UP	358,700



No Change in Prices; Sellers Hail Reduced Crude Runs to Stills

REFINED-product prices were unchanged over the past week following the adjustments of the previous week in several areas.

The gasoline market continued to be described as "weak" although domestic movements reflect satisfactory consumer demands for this season of the year. The heavier products are generally firm in anticipation of large seasonal increases in demand for distillates.

Weakness in gasoline, including natural gasoline, centers in the Gulf Coast where most prices were lowered earlier in the month. Further reductions in prices are not anticipated at this time.

The Gulf Coast markets also continue to suffer from the steady climb in tanker rates for both coastal and foreign movement. In times of oversupply, such as the present, the spot sellers usually have to absorb part of these increases in tanker rates.

The most encouraging and most discussed development affecting current and long-range markets centers around the 657,000-bbl.-daily reduction in domestic crude runs to stills from September 7 to week ending October 19. While it is assumed that this trend toward rapid decrease in runs to stills will not continue, it is hoped that it does point to comparatively low runs in November needed to improve the present excessive inventory of gasoline.

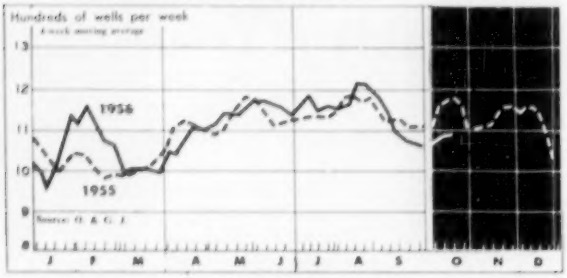
The rather drastic action taken by several refining organizations in recent weeks in reducing operations is an attempt to arrive at a sound supply-demand-inventory position. It emphasizes changes that have taken place since World War II in total demands and demand for individual products. This shift in total demands by months and quarters for 1946 and 1955 is shown in the following table:

	Per cent of total yearly demand	
	1946	1955
January	8.6	9.0
February	7.7	8.4
March	8.1	8.3
First quarter	24.4	25.7
April	8.1	7.7
May	8.5	7.7
June	8.2	7.9
Second quarter	24.8	23.3
July	8.3	7.7
August	8.3	8.2
September	7.8	7.9
Third quarter	24.4	23.8
October	8.4	8.1
November	8.5	8.9
December	9.5	10.2
Fourth quarter	26.4	27.2
Year	100.0	100.0
First and fourth quarters	50.8	52.9
Second and third quarters	49.2	47.1

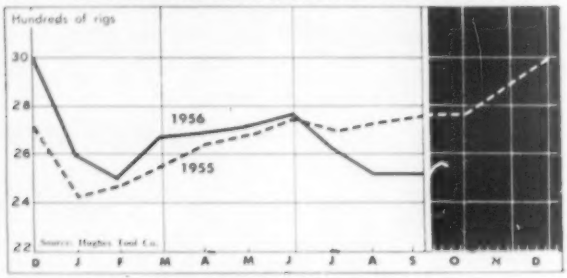
Summarized, the table shows that the precentage of the winter market jumped 2.1 from 1946 to 1955 with the same decrease in the summer market (second and third quarters). The percentage change in the relative position of some of the individual products is greater than that applying to total demands.

Many refiners realize this situation and they are more and more making seasonal changes in their plant operations to prevent the accumulation of excess inventories. This applies not only to crude to stills but also to changes in yields. But the developments of the past few months reveal that there is need for greater attention to this situation by refiners as a group.

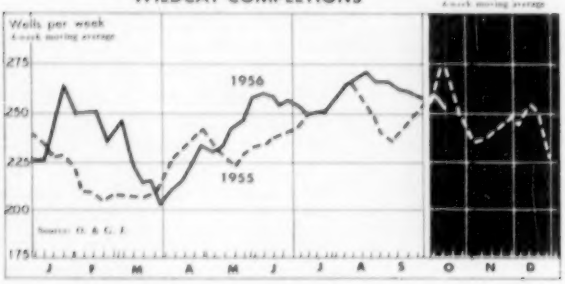
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	10-22-56	10-15-56	10-24-55
North Central and East	118	129	149
Southeast	41	44	40
Okla., Kans., Ark., Mo.	452	467	542
Louisiana	445	421	415
North and East Texas-Panhandle	371	373	399
Gulf and South Texas	245	239	261
West Texas-New Mexico	500	506	540
Rocky Mountain	264	267	303
Pacific Coast	117	119	146
Total United States	2,553	2,565	2,795
Western Canada	225	236	203

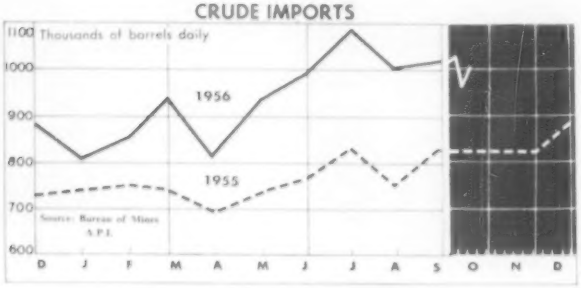
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED OCTOBER 20, 1956

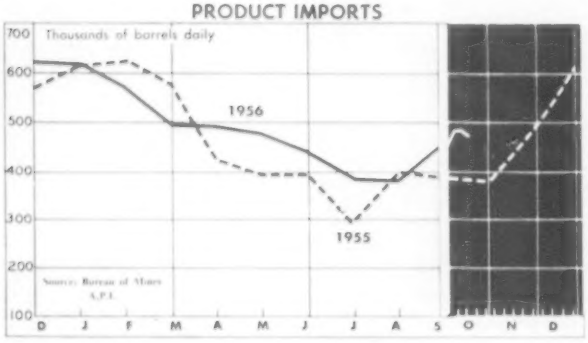
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1956	Cum. 1955	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1956: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	4	2	0	2	25,732	88	64	0	0	0	2	2	0	0	1	37	38
Arkansas	19	18	0	1	49,284	742	646	0	0	0	0	0	29	0	4	116	149
California	35	28	2	5	153,416	1,783	1,989	0	0	0	5	5	43	0	9	366	418
Colorado	21	4	0	17	98,043	967	1,208	0	0	0	12	12	22	0	13	479	514
Illinois	89	35	9	45	184,491	3,191	3,128	0	0	0	14	14	43	0	3	571	617
Indiana	19	4	0	15	33,796	556	586	1	0	0	5	6	15	0	1	98	114
Kansas	74	34	4	*36	266,819	4,020	4,061	1	1	2	15	19	101	3	33	729	866
Kentucky	37	14	2	21	51,353	1,518	1,255	0	0	0	8	8	34	0	1	316	351
Louisiana	86	30	13	43	668,065	3,081	3,234	4	1	2	19	26	96	47	50	434	627
North	42	11	4	27	181,221	1,347	1,674	1	0	0	12	13	26	2	3	181	212
South	41	18	8	15	451,591	1,403	1,560	2	1	2	7	12	57	40	34	223	354
Offshore	3	1	1	1	35,253	331		1	0	0	0	1	13	5	13	30	61
Michigan	5	2	0	3	13,967	354	436	0	0	0	2	2	8	0	2	128	138
Mississippi	6	2	0	4	56,405	356	357	0	0	0	3	3	13	1	1	158	173
Montana	12	5	0	7	65,417	372	308	0	0	0	6	6	10	0	1	125	136
Nebraska	20	5	0	15	101,075	782	702	0	0	0	11	11	32	0	1	352	385
New Mexico	57	24	24	9	220,079	1,548	1,361	2	0	0	6	8	42	0	8	162	212
Northwest	31	3	24	4	115,394	691	455	1	0	0	3	4	10	0	7	57	74
Southeast	26	21	0	5	104,685	857	906	1	0	0	3	4	32	0	1	105	138
North Dakota	5	4	0	1	30,335	211	207	0	0	0	0	0	8	0	0	53	61
Ohio	29	15	4	10	52,734	867	973	0	0	1	0	1	2	0	3	6	11
Oklahoma	139	85	8	†46	510,076	6,732	6,860	3	1	0	11	15	103	18	31	560	712
Pennsylvania-New York	4	0	4	0	21,561	748	1,235	0	0	2	0	2	0	0	11	11	22
Texas	414	230	23	161	1,680,963	17,872	16,306	16	0	7	92	115	605	31	154	3,768	4,558
Southwest (1 & 4)	69	29	8	32	235,797	2,559	2,519	2	0	3	23	28	110	6	53	718	887
Gulf Coast (2 & 3)	52	29	5	18	323,342	2,125	2,034	2	0	2	12	16	56	16	54	578	704
East (5 & 6)	15	4	2	9	84,009	932	795	1	0	0	6	7	14	2	5	313	334
N. Central (7-B & 9)	149	78	0	71	435,872	6,422	6,122	6	0	0	33	39	265	0	11	1,510	1,786
West (7-C & 8)	92	62	4	26	450,897	4,762	3,986	4	0	0	18	22	143	0	10	595	748
Panhandle (10)	37	28	4	5	151,046	1,072	850	1	0	2	0	3	17	7	21	54	99
Utah	1	1	0	0	5,526	100	78	1	0	0	0	1	6	0	4	50	60
West Virginia	15	3	11	1	42,034	543	530	0	0	0	0	0	0	0	10	9	19
Wyoming	22	10	1	11	72,617	703	726	0	0	1	2	3	14	0	10	183	207
Miscellaneous	0	0	0	0	0	70	53	0	0	0	0	0	4	0	0	59	63
Total United States	**1,113**	555	105	453	4,403,788	47,204	46,303	28	3	15	213	**259**	1,230	100	351	8,770	10,451
Total previous week	1,103	586	96	421	4,098,607			32	1	9	188	230	1,202	97	336	8,557	10,192
Total Oct. 22, 1955	1,074	580	82	412	4,351,210			29	4	3	190	226	1,329	174	287	8,146	9,936
Cumulative 1956	47,204	25,435	3,285	18,483	189,939,727												
Western Canada	68	55	3	10	238,254	2,555											

Service wells included: *3, †13.

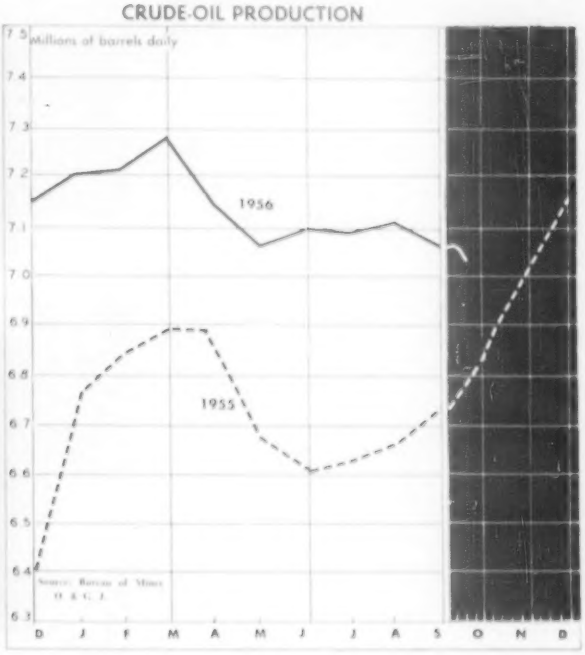
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

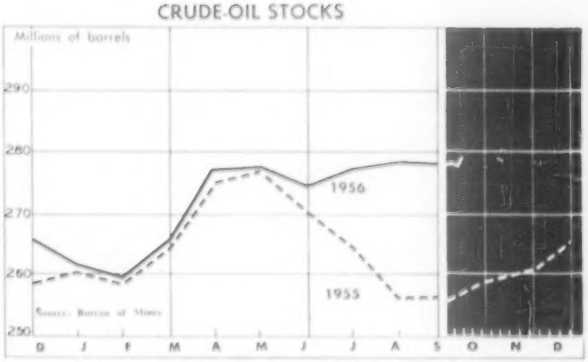


DAILY AVERAGE PRODUCTION FOR WEEK

	October 20, 1956			Oct. 13
	Crude oil	Lease condensate	Total	total
Alabama	10,050		10,050	10,000
Arkansas	77,150	300	77,450	77,700
California	958,600		958,600	956,800
Colorado	160,500		160,500	157,000
Eastern	50,300		50,300	50,700
Florida	1,375		1,375	1,375
Illinois	233,600		233,600	237,400
Indiana	31,300		31,300	32,400
Kansas	332,100		332,100	336,200
Kentucky	46,200		46,200	46,900
Louisiana	735,500	63,600	799,100	799,800
North	118,000	2,100	120,100	120,800
South	617,500	61,500	679,000	679,000
Michigan	26,800		26,800	28,300
Mississippi	108,950	4,700	113,650	113,650
Montana	61,300		61,300	61,250
Nebraska	39,050		39,050	37,900
Nevada	200		200	200
New Mexico	241,600	3,700	245,300	245,200
North Dakota	35,300		35,300	35,200
Oklahoma	†572,200		†572,200	†558,600
Texas	2,876,000	51,900	2,927,900	2,927,900
Dist. 1	56,000	500	56,500	56,500
Dist. 2	141,000	8,100	149,100	149,100
Dist. 3	410,000	24,500	434,500	434,500
Dist. 4	227,000	6,200	233,200	233,200
Dist. 5	41,000	450	41,450	41,450
Dist. 6	121,000	5,900	126,900	126,900
East Texas field	196,000		196,000	196,000
Dist. 7-B	158,000	50	158,050	158,050
Dist. 7-C	170,000	3,900	173,900	173,900
Dist. 8	1,043,000	1,600	1,044,600	1,044,600
Dist. 9	211,000	500	211,500	211,500
Dist. 10	102,000	200	102,200	102,200
Utah	7,500		7,500	4,900
Wyoming	285,500		285,500	287,400
Others	‡100		‡100	‡100
Total U. S.	6,891,175	124,200	**7,015,375**	7,006,875
Change from prev. week, up			**8,500**	
Canada	†503,288		†503,288	†453,800
Total U. S. prod., January 1-October 20			2,097,025,475 bbl.	
Same period last year			*1,977,368,701 bbl.	

*Includes 32,934,150 bbl. condensate. †Week ended previous Monday. ‡S. Dakota.

CRUDE-OIL STOCKS



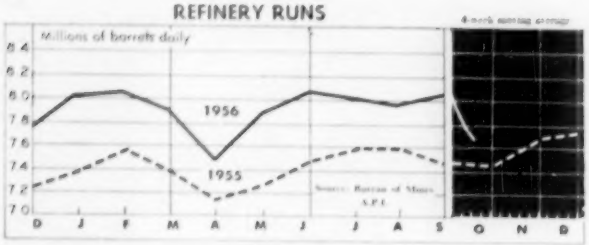
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

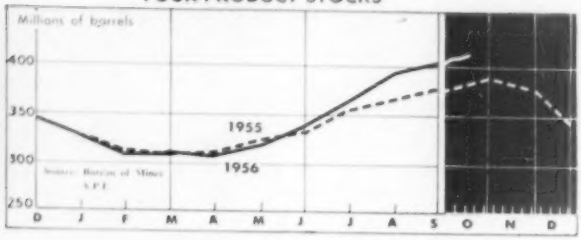
	10-13-56	10-6-56	10-15-55
Pennsylvania Grade	2,466	2,490	3,284
Other Appalachian	2,583	2,529	1,826
Illinois, Indiana, Michigan	11,288	11,373	9,329
Nebraska, North Dakota	2,263	2,003	2,480
Kansas	9,753	10,000	8,633
Oklahoma	25,053	24,903	20,262
Arkansas	2,700	2,812	2,348
Louisiana	18,727	18,123	16,016
North	2,556	2,417	2,612
South	16,171	15,706	13,404
Mississippi	3,046	2,948	3,119
New Mexico	8,631	8,439	7,313
Texas	125,582	124,675	121,140
East Texas proper	8,580	9,042	9,315
West Texas	61,150	60,505	57,610
Texas Gulf	24,083	23,261	24,354
Other Texas	31,769	31,867	29,861
Wyoming	17,206	17,165	14,285
Other Rocky Mountain	6,518	6,249	4,789
California	28,648	28,125	27,098
Foreign	†14,994	15,133	13,212
Total	279,458	276,967	255,134

*Bureau of Mines. †Includes 3,893,000 bbl. in California.

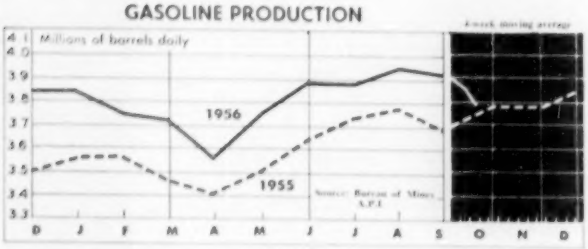
REFINERY RUNS



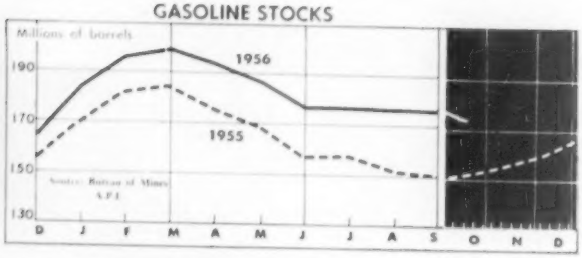
FOUR-PRODUCT STOCKS



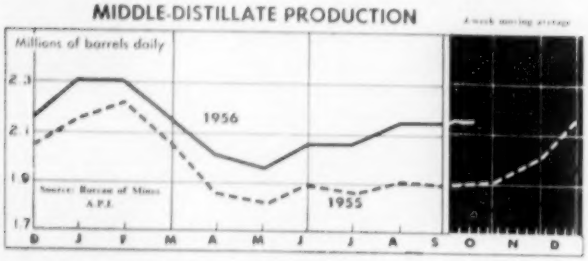
GASOLINE PRODUCTION



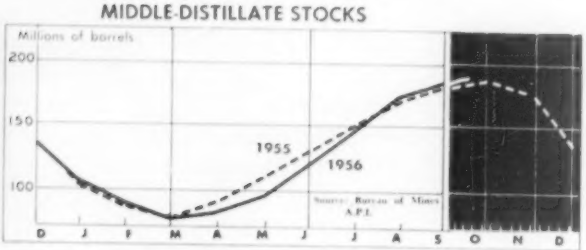
GASOLINE STOCKS



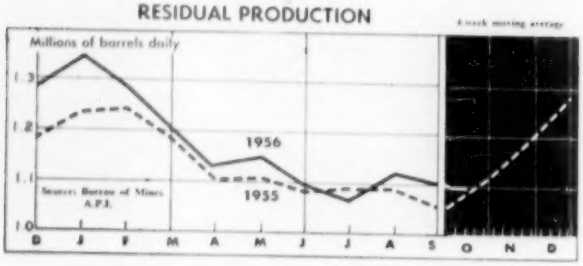
MIDDLE-DISTILLATE PRODUCTION



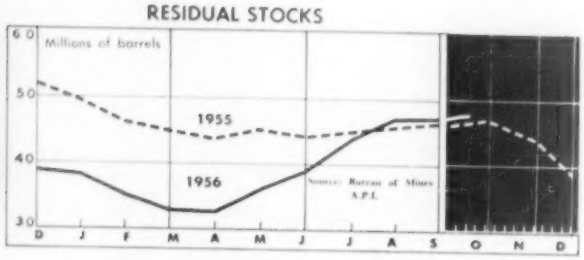
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, OCTOBER 19, 1956

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, October 1955—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,154	455.3	62.0	331.9	202.6	42,677	13,455	58,525	12,127	1,054	452.1	31.9	254.5	201.8
Appalachian:														
District 1	107	44.4	4.2	25.3	4.9	4,373	564	3,362	482	100	42.0	4.7	19.7	7.1
District 2	85	45.3	4.2	13.7	10.4	2,793	758	966	370	98	48.2	5.4	12.4	13.5
Ind., Ill., Ky.	1,375	681.3	83.4	247.9	184.4	30,613	7,547	24,343	5,922	1,357	754.7	57.9	258.9	177.1
Minn., Wis., Dak.	47	22.4	1.7	13.0	3.0	6,407	1,701	8,198	122	(§)	(§)	(§)	(§)	(§)
Okla., Kans., Mo.	618	369.6	10.0	153.4	33.0	14,549	1,903	13,670	1,512	656	391.1	12.2	163.0	19.4
Inland Texas	247	199.6	5.3	56.0	23.3	7,459	595	2,248	1,790	243	192.8	8.7	49.6	23.2
Texas Gulf Coast	1,759	876.7	129.4	465.4	231.3	23,439	3,484	16,804	6,606	1,813	866.5	113.0	450.9	230.7
La. Gulf Coast	689	327.9	78.3	166.7	42.0	9,910	2,480	7,687	1,545	684	349.3	58.8	162.0	43.2
N. La. and Ark.	95	40.0	8.4	19.9	5.6	4,351	604	2,223	271	90	33.3	7.9	22.1	6.2
Rocky Mountain:														
New Mexico	23	12.4	0.4	4.7	3.0	475	19	113	64	22	11.7	0.4	4.0	2.9
Other Rocky Mtn.	267	117.1	1.7	64.4	34.4	4,853	455	3,274	875	240	115.4	2.6	58.2	36.7
West Coast	1,064	473.4	7.0	149.0	328.1	21,188	364	13,875	16,029	1,108	508.8	5.1	158.0	361.5
Oct. 19, 1956	7,530	3,665.4	396.0	1,711.3	1,106.0	173,087	33,929	155,288	47,715	7,465	3,765.9	308.6	1,612.4	1,123.3
Oct. 12, 1956	7,498	3,772.1	331.9	1,771.7	1,098.9	174,062	33,564	153,199	47,349					
Oct. 21, 1955	7,477	3,726.3	321.9	1,544.7	1,102.4	151,536	36,844	149,886	46,641					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines. §Included in Indiana, Illinois, Kentucky district.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (88 octane)	11.00-11.50
Premium (96 octane)	12.75-13.25
Gulf Coast (cargoes for coastwise or export movement):	
Regular (90 octane)	11.00-11.50
Regular (92 octane)	11.25-11.75
Premium (97 octane)	12.75-13.25
Premium (98 octane)	13.00-13.50
California—Los Angeles (rack):	
Regular (84 octane)	12.1-12.6
Premium (93 octane)	13.35
Premium (96 octane)	14.3-14.6
Caribbean area (cargoes):	
Regular (87 octane)	10.00
Premium (93 octane)	11.50

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	5.0
Breckenridge:	
Grade 26-70	4.5

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	10.00-10.25
Diesel oil (58 d.i. and above)	9.75-10.00
Distillate No. 1	9.625-9.875
Distillate No. 2	9.00-9.25
Gulf Coast (cargoes):	
Kerosine 41-43	9.5
Distillate No. 2	8.75
New York Harbor (barges):	
Kerosine 41-43	11.25
Distillate No. 2	10.65
Diesel fuel, 48-52 d.i.	10.95
Caribbean area (cargoes):	
Distillate No. 2	8.75

WAX (I.B.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$2.05-2.10
Gulf Coast (cargoes):	
Bunker C fuel	$2.10
New York Harbor (barges):	
Bunker C fuel	$2.80
Caribbean (cargoes):	
Bunker C at Aruba, N.W.I.	$2.10
California (rack):	
Bunker C fuel, Los Angeles	$2.15-2.25

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	24
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.75
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	27
200 vis. neutral (180 at 100°), 25 p.t.	25

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.02				
15-15.9	2.08				
16-16.9	2.13				
17-17.9	2.19				
18-18.9	2.24				
19-19.9	2.30				
20-20.9	2.35	$2.50		$2.37	
21-21.9	2.41	2.52		2.39	
22-22.9	2.47	2.54		2.41	
23-23.9	2.52	2.56		2.43	
24-24.9	2.58	2.58	$3.01	2.45	
25-25.9	2.64	2.60	3.03	2.47	$2.13
26-26.9	2.69	2.62	3.05	2.49	2.19
27-27.9	2.76	2.64	3.07	2.51	2.24
28-28.9	2.83	2.66	3.09	2.53	2.29
29-29.9	2.91	2.68	3.11	2.55	2.34
30-30.9	2.97	2.70	3.13	2.57	2.39
31-31.9	3.04	2.72		2.59	2.44
32-32.9	3.12	2.74		2.61	2.48
33-33.9	3.20	2.76		2.63	2.52
34-34.9	3.27	2.78		2.65	2.56
35-35.9	3.34	2.80		2.67	2.60
36-36.9	3.39	2.82		2.69	2.64
37-37.9		2.84		2.71	2.66
38-38.9		2.86		2.73	2.68
39-39.9		2.88		2.75	2.70
40 and up		2.90		2.77	2.72

*Includes Oklahoma, Kansas, North Dakota, West Texas (sweet), North Central Texas, North Louisiana, Arkansas. †Low-cold-test Gulf Coast. ‡Sour.

Effective dates: California, February 7, 1956; east of California, June 15, 1953; Pennsylvania Grade, August 16, 1956.

Some crudes in North Central Texas, West Central Texas, and Texas Panhandle have been shifted to the intermediate schedule with $2.83 for 40° and 2 cents per degree drop. Effective dates range from July 15, 1956, to August 10, 1956.

FLAT PRICES

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	4.68
Middle District	4.50
Southwest Pennsylvania	4.21
West Virginia	4.03
Buckeye Grade	4.07
Zanesville Grade	3.15
Illinois Basin	**2.90**
Canada:	
Leduc-Woodbend (flat prices D-2, D-3)	2.60
Redwater (Alta.) D-3	2.49
Smiley-Viking (Sask.)	2.26
Fosterton (Sask.)	1.29
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-49.8°, Tucupido	*3.40
San Joaquin, 41°-41.9°, Puerto La Cruz	*3.04
Oficina, 35°-35.9°, Puerto La Cruz	$2.80
Tia Juana medium, 26.5°-26.9°, Amuay§	‡2.30
Quiriquire, 16.5°-16.9°, Caripito	‡2.21
Lagunillas heavy, flat, Amuay or Las Piedras§	2.05
Bachaquero, 16.5°-16.9°, Amuay or Las Piedras§	‡1.90

*Plus or minus 2 cents per barrel for each degree gravity change. †Plus or minus 2.5 cents per barrel for each half-degree gravity change. ‡Plus or minus 3.5 cents per barrel for each half-degree gravity change. §Also available at La Salina at 3.0 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0°-34.9°, Abadan	1.86
Iraq, 36.0°-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.46
Iraq, 36.0°-36.9°, Tripoli, Banias	2.46
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°-38°	2.60

TANKER RATES PER LONG TON
(Latest reported spot fixtures)

Gulf-U.S.N.H., clean (USMC+60%)	$4.56
★ Gulf-U.S.N.H., dirty (USMC+72.5%)	4.92
★ N.W.I.-U.S.N.H., dirty (USMC+100%)	5.40
★ N.W.I.-U.K., dirty (Scale+110%) (68s. 3d.)	9.51
★ P.G.-France, dirty (USMC+62.5%)	17.71
★ P.G.-U.K., dirty (Scale+250%) (189s. 4d.)	24.38

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FOR SALE OR TRADE

#3A-6 National Drilling Machine, Spudding Top, Steel Bull Wheels Air Cooled, Steel Band Wheel, Twin Brake OCS Sand Reel, OCS Drilling Clutch, D13000 Cat Diesel Engine. All guaranteed to be in first class condition. Have extra D13000 Cat and Clutch will sell.

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A 250 BARREL B. S. & B. BOLTED GALVANIZED TANK.

Used two years for water supply.

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5½", 7", 9⅝", and 13⅜" OD casing also available.

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CARDWELL 1459K two drum Model R Spudder with 55 ft. new single leg mast on skids with roof and walks. Price $11,000.00 F.O.B., Wichita, Kansas, Cardwell Investment Company, Inc., 604 Petroleum Building.

MODEL U-15 UNIT RIG complete with L. C. Moore double jackknife derrick, 3508' new and 3200' used 4½" drill pipe, 19 drill collars. Rig and motors in A-1 condition. W. D. Kelley Drilling Co., 409 Combs-Worley Bldg., Pampa, Texas.

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UOP RATED 144 BBL./DAY

1—Wyatt 30" x 70' Stabilizer 160# 30 tray
6—Brown fintube exchangers, 300# 140 sq. ft. 4-6 chrome.
1—5' x 96' tower, 40 tray, 135# WP.
1—6' x 34' Vacuum tower, 150#.
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3—Convection furnaces, 30 MIL BTU/hr
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8—Hi-vol pumps, 10 x 7 x 18, 10 x 6 x 12, 6 x 4 x 12, 6 x 3 x 8.
4—Steel Bldgs., 20 x 20, 20 x 40.
1—BS&B O&G separator, 10.7 mcf/day. Large Selection of Series 15, 30 Steel Valves, 1" to 8".
Approximately 15,000 ft. Schedule 40, 80 pipe, 2" to 8".

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3 Pacific ITB, 400 gpm—2,000' hd, 735 gpm—3,100' hd.
5 Pacific SVTB, 612 gpm—600' hd, 324 gpm—480' hd, 308 gpm—516' hd, 193 gpm—389' hd.
1 Pacific HVTB (unused) 1270 GPM—408' HD.

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10—Kellogg Adm. Fltg. Hd. 2700, 2200, 1800 Sq. Ft.
6—Kellogg Steel Fltg. Hd. 1300, 800, 500 Sq. Ft.

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1 Worth LTC-6 800 hp
2 Clark RA-5 500 hp.
1 Worth LTC-3 400 hp.
3 Penn Comps 100 CFM 500 lbs. 385 CFM 160 lbs.

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GAS COMPRESSORS—3 Bessemer Type 10 twins direct connected units—Boswell-Frates Company, 1003 Kennedy Building, Tulsa, Oklahoma.

COMPRESSOR BUILDING — Structural steel, 12' x 35' x 120'. Boswell-Frates Company, 1003 Kennedy Building, Tulsa, Oklahoma.

CARDWELL MODEL "S", double drum with WAK Waukesha, 87 foot Moore mast, folding platform, substructure; Emsco 7½ x 14 pump with two WAK Waukesha; rotary, block, hook, kelly, swivel, BOP, light plants, tool house, bunk house, miscellaneous equipment. Box 3246, Corpus Christi, Texas.

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550 Tons J-55 Oil Well Casing
5½" x 15.5 x 28'/32'
API Monogram Moody's Inspection
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FOR SALE EQUIPMENT

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C-34 WALKER-NEER Spudder. A-1 condition. Complete with 5 and 7-in. tools. Priced to sell. Located at Drumright, Oklahoma. Contact Box 788, or Phone 20, Drumright.

36L BUCYRUS RIG, tools to 12" all lines, light plant, dog house, excellent condition, cost $40,000, quick sale $20,000. Box J-782, The Oil and Gas Journal, Tulsa, Oklahoma.

60 DRILL COLLARS, Sonoscoped 3½", 4" and 4½" Drill Pipe. Don Harman Pipe & Supply, ME 7-4343, Okla. City, Okla.

3,652' 4½" O.D. converted drill pipe with J-55 couplings, 5,000# test; 3,378' 4½" O.D. 9½# J-55 new casing. Call LUther 4-0595 or write Rio Hondo Oil and Development Corp., 1122 Galennie Street, New Orleans, Louisiana.

R-6 WICHTEX drilling rig with R-6 Wichtex drawworks, 93' poles 10" and 8" with doubleboard; 145 GKBU motor; 14½" Ideco table; Oil Well 7½" x 12" 212 pump with Waukesha 6-NKRU motor, unitized; 3,680' 4½" drill pipe; all other necessary components and parts making up complete rig ready to drill, located Bristow, Oklahoma. Call LUther 4-0595 in Tulsa or write Cherokee Drilling Company, 1122 Galennie Street, New Orleans, Louisiana.

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Limited supply available for drilling deals at list price plus reasonable non-participating interest or acreage. Outline deal and pipe requirements in letter.

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Graduate Petroleum Engineers with 2 years or more experience wanted by the Production Department of a major oil company. Openings available in Rocky Mountain and Mid-Continent areas. In first reply please give resume of experience and date available.

Box J-753, The Oil and Gas Journal,
Tulsa, Oklahoma.

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HELP WANTED

HYDRAULIC CASING pulling unit operators and helpers. Call GLadstone 3-4551, Great Bend, Kansas.

WANTED: Recently graduated electrical, civil or mechanical engineer or engineer with a few years experience needed for office and field work in pipe line division of major oil company in Middle West. Please state age, experience and educational qualifications. Box J-772, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESSING ENGINEER: Outstanding opportunity for qualified man to assume processing engineering of moderate size complete refinery. Must have proven supervisory ability and experience with modern processing, organization and economics necessary. Preferred age 35-45. Company is stable and aggressive with unusually good prospects. Location in developing area with agreeable living conditions. Salary and other terms of employment offer a highly profitable career to right man. Must have college education and at least ten years' experience in latest type refining units. All replies will be held confidential and no obligation will be incurred by applicant. For full particulars write to Box J-763, The Oil and Gas Journal, Tulsa, Oklahoma.

VALUATION ENGINEER

Petroleum Engineer with experience in appraisal and reservoir work wanted by permanently established independent oil company. Position requires practical as well as technical knowledge in the evaluation and financing of producing property purchases, and in administrative procedure. Must have the ability and initiative to develop necessary contacts in the active regions of the oil country. Reply should state age, education, experience, active references, and starting salary required.

BOX J-698,
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TULSA, OKLAHOMA.

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HELP WANTED

CHEMICAL ENGINEER for Independent Natural Gasoline Company located in the Permian Basin of West Texas. Prefer recent graduate with BS in chemical engineering, experience not necessary. Reply to Box J-769, The Oil and Gas Journal, Tulsa, Oklahoma.

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To assist and advise operating management on all maintenance services and practices in major oil installation located in Saudi Arabia.

Must be graduate engineer with minimum of 10 years' planning and operations experience in heavy industrial and refinery installations. Proven supervisory ability and thorough knowledge of maintenance craft methods and equipment required. Minimum salary $1000 monthly plus allowances and generous benefits. Excellent promotional opportunities.

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Recruiting Supervisor, Box 182

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A mature and responsible person with thorough training and broad experience in both operation and maintenance of petroleum refinery equipment to have charge of both of these functions in the refinery, the pipe line and the terminal.

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An engineer with general technological experience to have charge of both process design and mechanical design work. Scope of position is open and dependent on available person.

Chief Chemist
Responsible person with experience in petroleum product blending and familiarity with latest refinery laboratory methods.

Process Foreman
An operations supervisor of broad experience to work under the Plant Superintendent and to be in charge of all operating units.

Maintenance Foreman
An experienced supervisor familiar with all types of refinery equipment to work under the Plant Superintendent and to be in charge of maintenance and small construction in the refinery, pipe line and terminal.

Write, giving resumé including experience with processes listed, to

PONTIAC EASTERN CORP.
P. O. Box 1581, Corpus Christi, Texas
Applications for other positions will be taken at a later date.

HELP WANTED

FOREIGN EMPLOYMENT. List oil companies, drilling contractors, seismograph contractors, showing where apply foreign jobs. $5.00 cash. OIMI, Co., Box 2603, Tulsa, Okla.

OPERATIONS ENGINEER

Growing independent oil company wants petroleum engineer with three to six years of practical, technical, and administrative experience for position in operations planning and control section. Some knowledge of valuation work and oil and gas law would also be helpful. Reply should furnish details on education, experience, and references, and state age and required starting salary.

BOX J-784,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

PETROLEUM ENGINEERS

Major Oil Company has openings in Production Dept. in Venezuela for a number of graduate petroleum engineers.

OPENINGS also for petroleum, mechanical and chemical engineers for work in drilling, pipeline and gas depts. Salary commensurate with experience.

Please send details of Experience to:
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Box J-739,
The Oil and Gas Journal,
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FOR SALE BY ESTATE: 1504 mineral acres in Kearny, Gove, Scott, Sherman and Greeley Counties in Kansas. Gas production on part. Will make low net price. Leonard Waddell, 1002 Walnut Street, Kansas City, Missouri.

CONTACT A. L. BOWLES, Box 947, Ada Okla., for attractive drilling deal in Seminole Co., Okla., or will drill well selling ¼ to ½ interest.

I HAVE 10,000 ACRES under lease, solid block, where on nine different farms gas is coming from water wells drilled to 400, open flows were made and burned for several hours with no signs of diminishing. Tests 99% methane. Took several cylinders as samples. Gas in the Penn. fields sells for 28½ cents per 1000 ft. Gas in this area will sell for at least twice the amount. No allowables. Can sell all you can produce. Geologists say a good chance for top grade Penn oil. I need capital to drill four wells, will sell interests in the entire lease. Have the experience and know how. I believe this to be an opportunity that comes once in a life time. Will also invest own cash. This is not a promotional deal. It's up to you. Box 22, Emmaus, Pa.

UTAH. Leases on U. S. lands in areas of leasing and drilling activity. We have the sections selected and file your signed applications for you. 640 acres minimum lease. Read letters from clients who made big profits from our selections. You pay U. S. rents and pay us a service fee. John L. Donahue, 430—16th Street, Denver 2, Colorado. Phone ALpine 5-1087.

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Principals desire to purchase either for cash or stock or cash and stock substantial oil producing acreage. Preliminary information required to be given in any replies is gross annual revenue, number of wells, location, age of field, reserves, acreage drilled, acreage undeveloped, name of geologist if any recent reports available, offering price and terms. Reply to

BOX J-781,
THE OIL AND GAS JOURNAL,
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WANT TO BUY—Oil Properties, settled or semi-settled production. 100 to 5,000 barrels daily in Oklahoma and Kansas. Contact Morris Sitrin, 1215 First National Building, Tulsa, Oklahoma.

Equipment Men

Blodgett Heads Axelson's New Office in Denver

Axelson Manufacturing Co., division of U. S. Industries, Inc., has established a new district sales office in Denver, it has been announced by K. S. Ramey, sales manager, petroleum equipment department.

The new office, under the direction of D. D. Blodgett, sales manager, Rocky Mountain and Canada area, is located in the Farmers Union Building.

Prior to his Denver assignment, Blodgett was Canadian district manager located in Calgary, Alta. He has been with Axelson since 1943.

Taylor Promotes Reynolds, Humphrey

Robert B. Reynolds has been named industrial sales manager of Taylor Instrument Cos.' Chicago branch, and John Humphrey has become manager of the Philadelphia office, it was announced recently by L. Lawrence Forward, general sales manager.

Reynolds joined the Taylor organization in 1940 and formerly was industrial salesman in the San Francisco territory and later was assistant regional industrial sales manager in Chicago. During the last year he has been district manager in the company's Philadelphia office.

In 1938 Humphrey became a member of the Taylor sales staff dealing with petroleum processors. He worked out of the company's Philadelphia and Wilmington sales offices. He has had wide experience in the problems connected with the regulation of oil and gas processes.

Union Tank Introduces Expanded Product Line

An expanded product line was introduced at Houston recently to salesmen of Union Tank & Supply Division, Butler Manufacturing Co. Approximately 50 sales and service personnel from the major oil and gas-producing areas of mid-America and the Southwest heard D. E. Norquist, division general manager, and other officials outline developments in engineering, research, plant and stocking facilities, and sales and service.

Present at the meeting from Butler Manufacturing Co.'s general office at Kansas City were Glen Speakman, vice president in charge of sales; George Dillon, secretary; and Harold Edlund, general sales manager. Much of the 2-day meeting was spent on product training under the direction of Lawrence Dorsey, chief engineer.

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LEGAL

SEALED BIDS will be received until 2:00 P. M., Mountain Standard Time, November 1, 1956, and opened at that time in the Office of the Fort Peck Indian Agency, Poplar, Montana, for the leasing of 320 acres of allotted Indian land located in Township 31 North, Range 45 East, Valley County, Montana, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of the Fort Peck Indian Agency at Poplar, Montana, or telephone, Poplar, 2181.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT, Land Office, Cheyenne, Wyoming. Notice is hereby given that approximately 1158.38 acres of land in eleven parcels within the known geologic structure of the Salt Creek Field, Wyoming, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre through sealed bids on or before December 5, 1956, when bids will be opened. Details of the lease offering, and how and where to submit bids, may be obtained from the Land Office, Cheyenne, Wyoming. Perry T. Williams, Manager.

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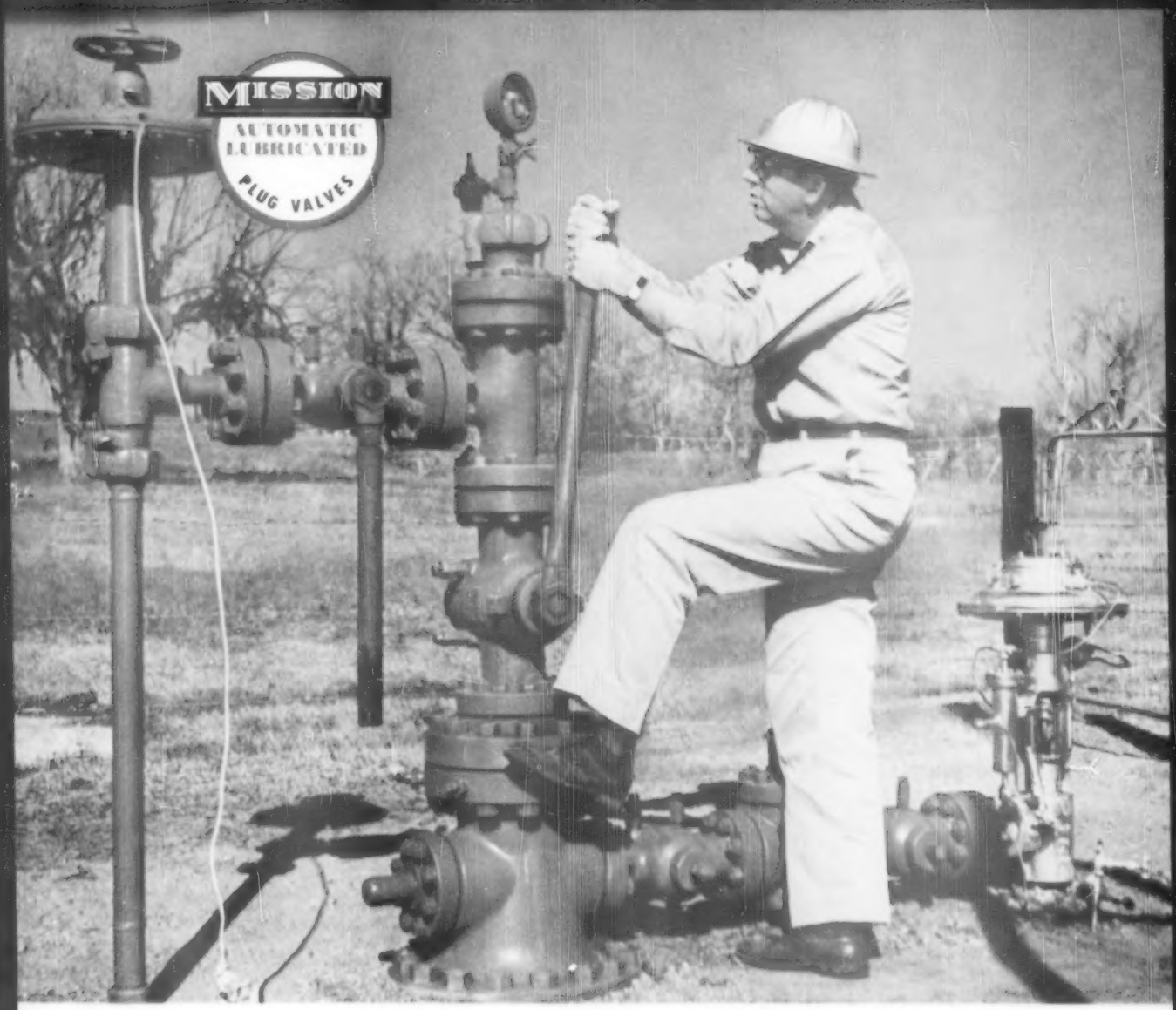

Why Automatic Lubrication Keeps Mission Plug Valves Young

In Mission Plug Valves, lubricant acts like plastic packing to form a gas-tight seal that can be renewed without disturbing production. The Automatic Lubrication system keeps this lubricant under line pressure to stop leaks — automatically — before they start! That is why Mission Plug Valves can be unconditionally guaranteed to outperform any other valves in their pressure range in the service for which they were designed.

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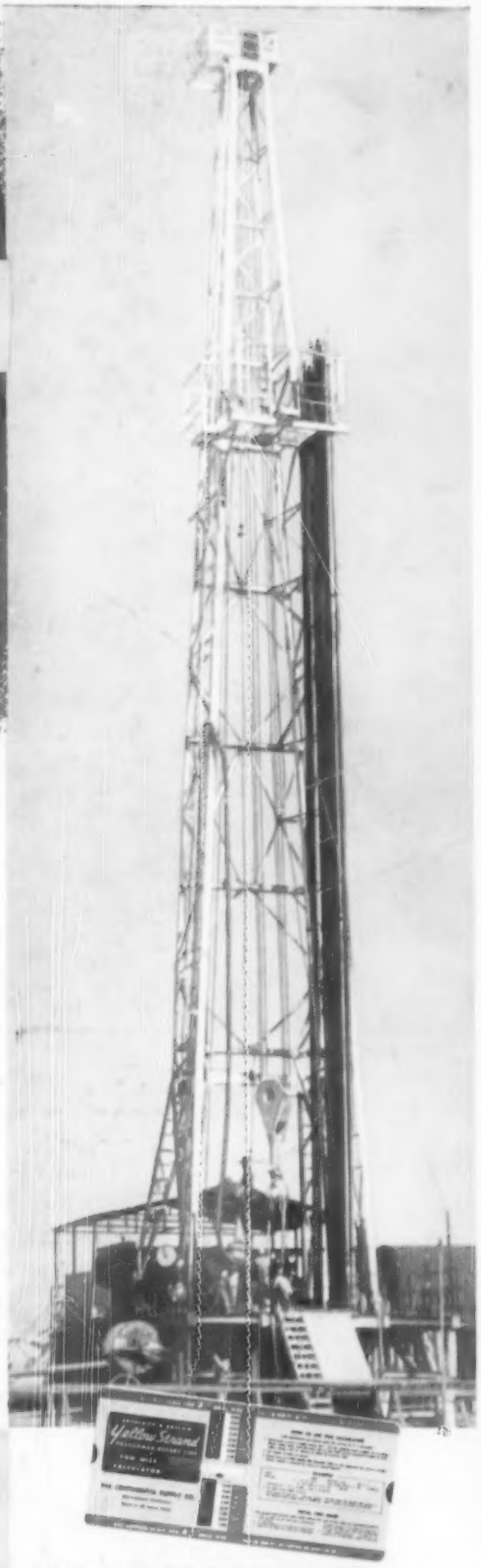
Take a tip from Urice Drilling Company, Fort Worth, Texas: One of their 3 "POWERSTEEL" equipped rigs is shown here, and they're well pleased with the performance of "POWERSTEEL." Urice has used Yellow Strand Wire Rope for 7 years, supplied by Continental Supply Co., Broderick & Bascom Distributors.



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